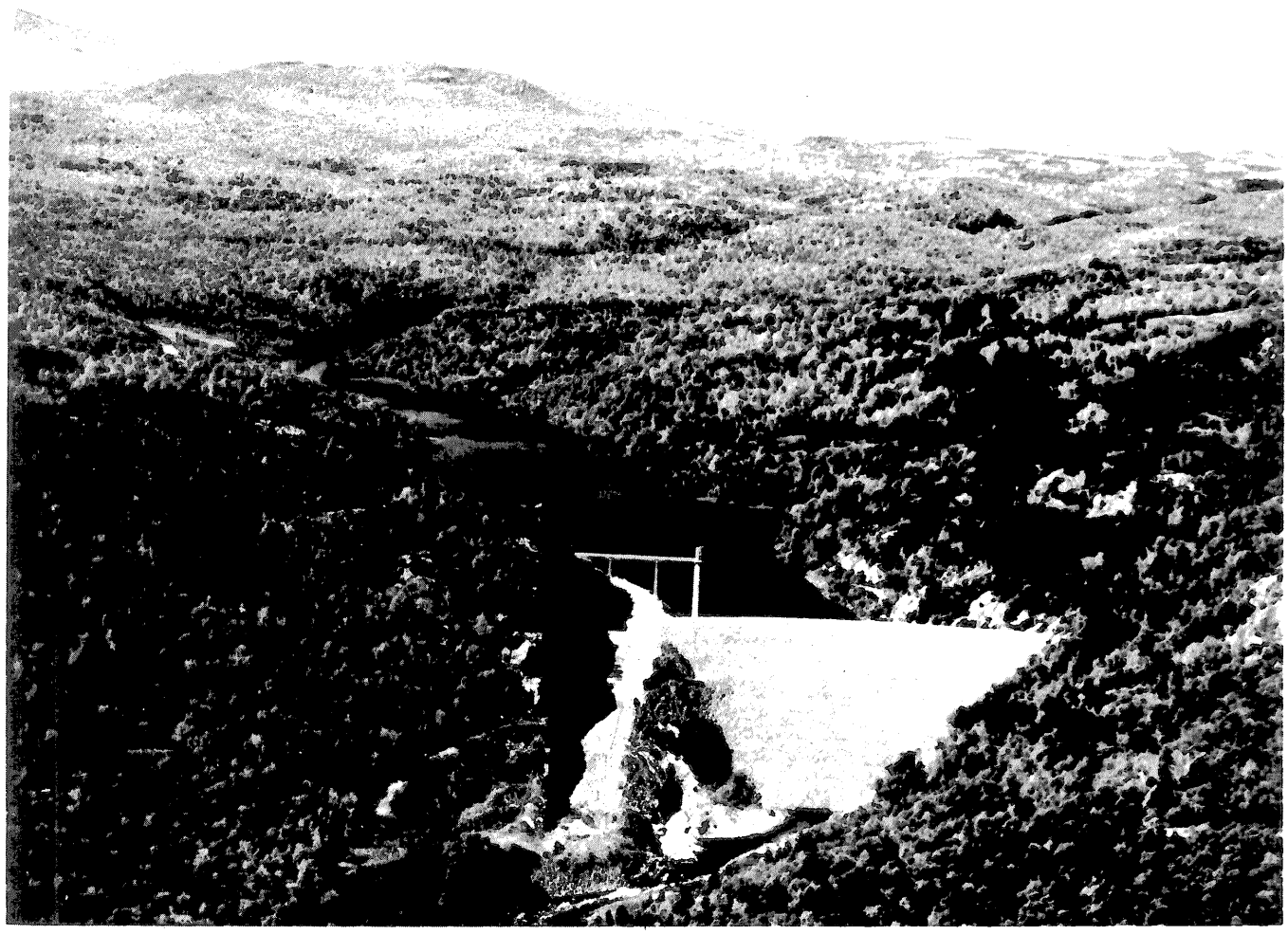
FLOOD EMERGENCY PLAN

Ball Mountain Lake



US Army Corps
of Engineers
New England Division

JUNE 1985

FLOOD EMERGENCY PLAN
FOR
BALL MOUNTAIN LAKE

Prepared By:
CLEVERDON, VARNEY & PIKE, INC.
Consulting Engineers & Architects

For:

US Army Corps
of Engineers
New England Division

SYLLABUS

This emergency plan outlines procedures to be used as a guide in the event that critical conditions develop which may lead to failure of the dam at Ball Mountain Lake or an uncontrolled release of water resulting in downstream damage. The plan directs responsibilities of Corps of Engineers personnel to take necessary and immediate remedial action to prevent or minimize loss of life and property damage.

BALL MOUNTAIN LAKE

FLOOD EMERGENCY PLAN

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BALL MOUNTAIN LAKE

FLOOD EMERGENCY PLAN

1. INTRODUCTION

a. Purpose - This plan provides a guide for actions to identify and mitigate or respond to various types of emergencies which, while rare, could occur in the operation of Ball Mountain Lake. The resulting actions are intended to protect the public from possible property damage or loss of life from the particular emergency situation.

b. Applicability - The emergency plan is applicable to all Corps elements and field offices involved with the operation of Ball Mountain Lake.

c. References

(1) Federal Guidelines for Dam Safety, dated 25 June 1979.

(2) ER 1110-2-1802, Reporting Earthquake Effects, dated 25 July 1979.

(3) ER 1130-2-419, Dam Operations Management Policy, dated 18 May 1978.

(4) OCE letter (DAEN-CWR-P), dated 30 November 1979, Subject: Policy Issue No. 79-13, Corps Role in Emergency Planning for Areas Downstream of Corps of Engineers Dams.

(5) ER 500-1-1, Emergency Employment of Army and other Resources, Natural Disaster Procedures, dated 21 December 1983.

(6) OCE letter (DAEN-CWE), dated 20 March 1978, Subject: Evacuation Plans for Areas Downstream of Corps Dams and Corps/State Cooperation on Safety Review of Corps Dams.

(7) Flood Emergency Plans, Guidelines for Corps Dams, dated June 1980, by Hydrologic Engineering Center.

(8) Ball Mountain Lake, Dam-Break Flood Analysis, dated September 1981, by New England Division.

(9) Connecticut River Basin, Master Water Control Manual, Appendix D, West River Watershed, dated September 1973, by New England Division.

(10) Ball Mountain Lake, Operation and Maintenance Manual, dated June 1972, by New England Division.

(11) Ball Mountain Lake, General Design Manual, dated 1956, by New England Division.

(12) Ball Mountain Lake, Review of Structural Stability, dated March 1984, by New England Division.

(13) EM-1110-2-1902, Embankment Stability Reevaluation, dated 1 April 1970, by New England Division.

(14) ER 1110-2-1806, Earthquake Design and Analysis for Corps of Engineers Projects, dated 16 May 1983, by New England Division.

(15) Periodic Inspection Report No. 3, Ball Mountain Lake, dated September 1984, by New England Division.

(16) Connecticut River Basin, Master Water Control Manual, dated November 1983, by New England Division.

(17) ER 1110-2-101, Reporting of Evidence of Distress of Civil Works Projects, dated 31 January 1984.

d. Scope - This plan covers identification of impending or existing emergencies, notification of other parties concerning impending or existing emergencies, and emergency operations and repairs. It addresses emergencies related to reservoir water levels above spillway crest and/or the rapid release of large volumes of water past the dam.

This flood emergency plan presently includes the following three subplans:

(a) EMERGENCY IDENTIFICATION SUBPLAN - SECTION 5

(b) EMERGENCY OPERATIONS AND REPAIR SUBPLAN - SECTION 6

(c) NOTIFICATION SUBPLAN - SECTION 7

THE EVACUATION SUBPLAN WILL BE PREPARED BY STATE AND/OR LOCAL CIVIL PREPAREDNESS OFFICIALS AT A LATER DATE.

2. DESCRIPTION OF PROJECT AREA

a. Location - Ball Mountain Lake is located in southeastern Vermont on the West River at Jamaica and Londonderry, Windsor County. It is about 29 miles upstream of the confluence of the West and Connecticut Rivers (see Plate 2-1).

The West River rises in the southeastern part of Mount Holly, Vermont. From its source to Ball Mountain Lake, the river flows in a southerly direction for about 23 miles and drops approximately 1,200 feet. The river then flows in a general southeasterly direction for about 9 miles to Townshend Lake with a drop of about 340 feet. From Townshend Lake the river continues in a southeasterly direction about 19 miles and drops about 240 feet to its confluence with the Connecticut River at Brattleboro, Vermont. Total drainage area of the West River is about 423 square miles, of which the upper 172 square miles are controlled by the Ball Mountain Project and an additional 106 square miles are controlled by the Townshend Lake Project located approximately 9 miles downstream of Ball Mountain Lake.

There are four major tributaries to the West River. They are, in downstream order: Winhall River, drainage area of 60 square miles; Ball Mountain Brook, drainage area of 35 square miles; Wardsboro Brook, drainage area of 36 square miles; and Rock River, drainage area of 59 square miles.

b. Topography - The topography of the West River valley is controlled by the pre-glacial erosional rock surfaces and drainage patterns with some lessening of relief effected by glacial erosion and deposition. Glaciation removed much of the residual soils and weathered rock and deposited these materials as glacial till in a thin mantle on the higher elevations and to greater thickness in the valleys, especially where they were transverse to movement of the ice. At the close of the glacial period during stagnation and recession of the ice sheet, glacial melt waters deposited sands and gravels on the valley walls and over the glacial till in the valley bottoms. The glacial deposits disarranged old drainage patterns and, although since glacial times degradation by the streams due to uplift has removed considerable amounts of the materials, the post glacial channels are usually high above and offset from their pre-glacial channels. Such is the case of the West River in the vicinity of the project where terrace and pot-hole remnants high on the valley walls attest to former levels of aggradation, and yet the river still flows some 60 feet above its pre-glacial channel.

c. Geology/Soils - The bedrocks of the region are principally highly folded and faulted metamorphosed sediments, schists, quartzites and gneisses of Ordovician age with some igneous intrusives. Locally, there are deposits of talc, limestone, serpentine and steatite which have been quarried and mined in the past. Presently, only talc schist is mined at North Windhan about 7 miles north of the dam.

At the site, bedrock, sericitic schist, is generally exposed or at very shallow depths to near river edge on the left abutment and is deeply buried under glacial till in the stream section and in the lower half of the right abutment of the dam, or to terrace elevation of about 900 feet NGVD, where it again becomes exposed to the summit of Ball Mountain.

d. Seismicity - The dam is located in Seismic Zone 2 which has a seismic coefficient of 0.10.

e. Climate - The average annual temperature in the watershed varies from about 40 degrees Fahrenheit (F) in the mountainous regions to 45 degrees F in the valleys. Average monthly temperatures vary widely from about 68 degrees F in July to about 18 degrees F in January. Extremes run from a low of -42 degrees F in December to a high of 102 degrees F in July.

The mean annual precipitation over the watershed is about 41.5 inches and is distributed uniformly throughout the year. Average monthly precipitation at nearby Townshend, Vermont varies from a minimum of 3.0 inches in February to a maximum of 4.3 inches in November. Normal annual snowfall is about 90 inches.

f. Project Features - Ball Mountain Lake is a flood control project built and operated by the Corps of Engineers. Construction was initiated in April 1956 and completed in October 1961. Ball Mountain Lake in conjunction with Townshend Lake is operated primarily to desynchronize flood flows of the West River from flood flows on the Connecticut River and to provide protection to the downstream West River communities. In addition, Ball Mountain Lake offers water-based recreational activities and includes a seasonal campground. The operation of Ball Mountain Lake is coordinated with other Corps of Engineers dams located in the Connecticut River Basin. The project is one of two flood control projects built by the Corps of Engineers in the West River Watershed. A reservoir map is shown on Plate 2-2 with a general plan of the dam on Plate 2-3.

Important physical components of the project consist of a rolled earth and rockfill dam, chute spillway, outlet works, facilities for recreational purposes and storage for both flood

control and recreation. Pertinent data for the project is summarized in Table 1.

The dam consists of rolled earth and rockfill embankments 915 feet long with a maximum height of 265 feet. The top of dam at elevation 1,052 feet NGVD provides for 30 feet of surcharge and 5 feet of freeboard. The top width of the dam is 20 feet and the side slopes vary from 1 on 1.75 to 1 on 2.50.

The chute spillway is located on the right abutment adjacent to the dam. The spillway is an uncontrolled ogee weir with a fixed crest at elevation 1,017 feet NGVD and a length of 235 feet. The spillway approach channel is about 450 feet long with a level invert at elevation 1,002 feet NGVD. The spillway discharge channel varies in bottom width from 228 feet at the toe of the spillway to 100 feet about 375 feet downstream. The invert slopes vary from 0.25 to 0.40.

The outlet works consist mainly of an intake tower, a conduit and an outlet channel. The intake tower houses the equipment necessary to operate the three 5'8" x 10'0" gates that control the flow in the conduit. The conduit, comprised of a concrete circular tunnel 13'6" in diameter, is 864 feet long and slopes at 0.002. At the end of the circular tunnel, the outlet works flare to the outlet channel which has a constant bottom width of 32 feet and slopes at 0.02 until it empties into the West River.

A small permanent pool is maintained to facilitate gate operations during the winter months. This 20 acre pool at elevation 830.5 feet NGVD has a water depth of 25 feet and about 240 acre-feet of storage. A conservation pool at elevation 870.5 feet NGVD is maintained during the summer and has a depth of 65 feet, an area of 75 acres and utilizes a net storage of 2,000 acre-feet. During the late fall, winter and spring months, there is a net storage of 54,450 acre-feet set aside for flood control purposes, which is equivalent to 5.90 inches of runoff from the 172 square mile drainage area. During the recreation season, the net storage is reduced to 52,450 acre-feet, equivalent to 5.70 inches of runoff. The reservoir, when filled to spillway crest elevation 1,017.0 feet NGVD, has a total capacity of 54,690 acre-feet, a surface area of 810 acres and a length of 6.5 miles.

g. Project Lands - Reservoir land for the project consists of 1,227 acres, of which 965 acres are owned in fee, to an elevation of 985 feet NGVD. The remaining 262 acres are comprised of flowage easements to elevation 1,057 feet NGVD. The recreational facilities consist of the Winhall camping area, containing 120 acres. Activities here include camping,

TABLE 1
PERTINENT DATA
BALL MOUNTAIN LAKE

LOCATION	West River, Jamaica and Londonderry, Vermont
DRAINAGE AREA	172 square miles
STORAGE USES	Flood Control, Recreation

RESERVOIR STORAGE

	Elevation (ft NGVD)	Stage (ft)	Area (acres)	CAPACITY Acre-Feet	CAPACITY Inches on Drainage Area
Inlet Elevation	805.5	0	0	0	0
Permanent Pool	830.5	25.0	20	240	0.05
Conservation Pool	870.5	65.0	75	2,000(net)	0.22(net)
Spillway Crest	1017.0	211.5	810	52,450(net)	5.7 (net)
Maximum Surcharge	1047.0	241.5	1160	29,550(net)	3.2 (net)
Top of Dam	1052.0	246.5	-	-	-

EMBANKMENT FEATURES

Type	Rolled earth fill, rock slope protection, impervious core
Length (feet)	915
Top Width (feet)	20
Top Elevation (feet NGVD)	1,052.0
Maximum Height (feet)	265
Volume (cubic yards)	2,311,000
Dike	None

SPILLWAY

Location	Right-West Abutment
Type	Uncontrolled, ogee weir and chute spillway in rock
Crest Length (feet)	235
Crest Elevation (feet NGVD)	1,017.0
Maximum Surcharge (feet above crest)	30.0
Maximum Discharge Capacity (cfs)	150,000

OUTLET WORKS

Type	Circular concrete tunnel
Tunnel Inside Diam. (feet)	13.5
Tunnel Length (feet)	864
Service Gate Type	Hydraulic slide
Service Gate Size	Three, 5'-8" wide x 10'-0" high
Emergency Gate Type	None (stoplogs only)
Downstream Channel Capacity (cfs)	5,000±
Maximum Discharge Capacity at Spillway Crest Elevation (cfs)	10,400
Stilling Basin	None

picnicking, swimming, fishing and sightseeing. Plates 2-4a and 2-4b delineate the limits of government-owned land.

There are several roads that pass through the reservoir areas that are subject to inundation during the storage of floodwaters. Inasmuch as public safety is involved in the use of these roads, the Project Managers are responsible for seeing that these roads are barricaded whenever necessary.

When a rising pool is expected to reach a stage of 160 feet, the Project Manager will consider barricading the following roads: old Route 52, Route 46, and Route 48. When a rising pool is expected to reach a stage of 175 feet, the Project Manager will consider barricading Route 38 and old Route 2. Location of these barricades is shown on Plates 2-4a and 2-4b.

h. Instrumentation -

(1) General - Instrumentation related to the regulation of the project includes equipment to record and monitor hydrologic conditions, reservoir outflow, reservoir levels and seismic activity.

(2) Hydrologic - Instrumentation at the dam includes a precipitation gage, a reservoir stage recorder, and downstream gaging stations.

A precipitation weighing and recording gage is installed at the dam. Also located at the site is an automatic float-operated reservoir stage recorder which monitors the water level. A tile staff gage is located on the outside of the control tower; during periods of reservoir storage, the outside tile gage is compared with the recorder tape readings and/or chart records to assure accuracy.

Discharges from Ball Mountain Lake are monitored by the USGS gage located 2.6 miles downstream of the dam. This gage is equipped with a float-operated digital type water stage recorder, and is operated and maintained by the USGS under a cooperative stream gaging program. Therefore, a continuous record of releases from the project is maintained.

Data collection platforms (DCP's) associated with Reservoir Control Center's satellite data reporting network have not been installed in the West River watershed. However, a DCP has been installed on the Connecticut River at Montague City, Massachusetts. This station reports stream flow data directly to Reservoir Control Center via National Oceanic and Atmospheric Administration's (NOAA) Geostationary Operational Environmental Satellite (GOES). The frequency with which data is transmitted

is dependent on the severity of hydrologic conditions at the gage. Therefore, reports from the gage will vary from once every 6 to 8 hours during normal conditions to every 30 to 60 minutes when river levels at the gage are rising rapidly or are at very high stages.

Measurements of snow depth and water equivalent in the West River watershed are conducted from 15 January to 15 April by personnel at Ball Mountain Lake and nearby Townshend Lake. These measurements enable Reservoir Control Center to estimate runoff potential from snowmelt in the watershed.

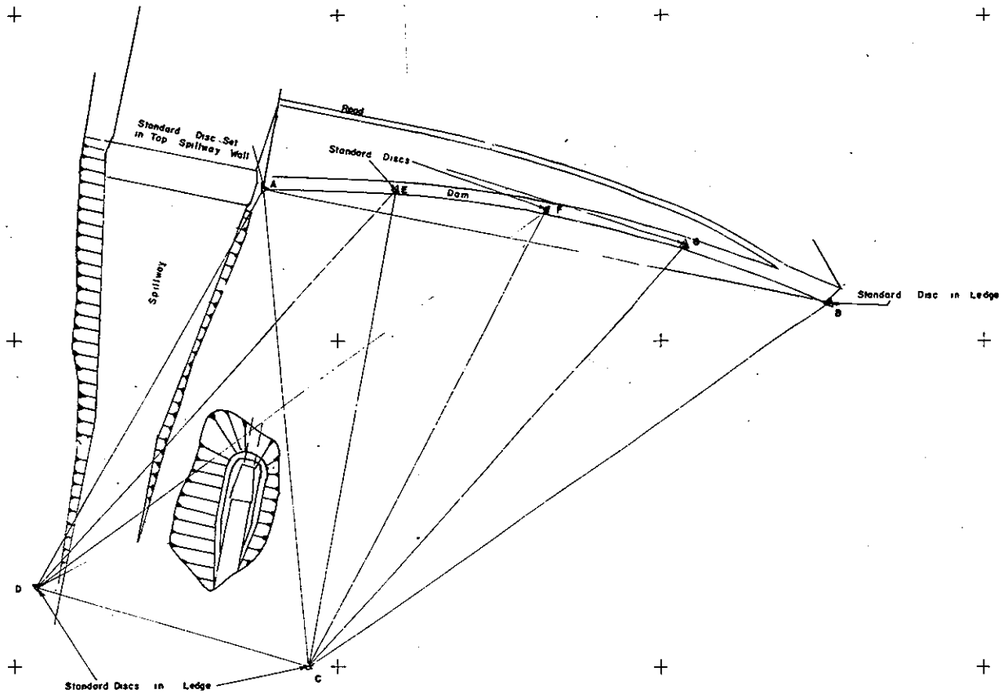
(3) Geotechnical Instrumentation - Since this dam is located in Seismic Risk Zone 2, strong motion instrumentation has been installed in accordance with ER 1110-2-103, dated 10 December 1982. This instrumentation records any seismic event greater than the triggering acceleration of 0.01 g. and is located on the dam crest, rock and free field. At present, strong motion instrumentation has been installed in twelve Corps projects as indicated on Plate 2-5. The present requirements for strong motion instrumentation at Corps sites is under review by the Corps headquarters.

Where strong motion instrumentation is located, Engineering Division staff (GEB-FES) may request the Project Manager to verify if instruments were triggered. Data retrieval from the instrumentation is performed by trained WES personnel.

Crest monumentation is on the dam to allow monitoring of vertical and horizontal movement. A total of three permanent monuments are located on the crest. (See Plate 2-6.) Funds are available in the FY 85 budget for installation of additional permanent crest monumentation. At present, dam piezometers have not been installed at Ball Mountain Lake.

i. Downstream Communities and Dams - The river downstream from Ball Mountain Lake travels through six small communities prior to reaching the Connecticut River at Brattleboro: Jamaica, East Jamaica, West Townshend, Townshend, Harmonyville and West Dummerston, in downstream order.

Downstream of the dam, the river normally ranges from 50 to 300 feet in width, with a corresponding flood plain ranging from zero near the dam to as much as 2,000 feet in width near Jamaica and West Townshend. The river channel drops approximately 340 feet between Ball Mountain Lake and Townshend Lake, a distance of 10 miles, and drops another 260 feet between Townshend Lake and the confluence with the Connecticut River, a distance of 19.5 miles. The average slope between Ball Mountain Lake and Townshend Lake is 34 feet/mile with the slope of the upstream



E 426500

E 427000

E 427500

E 428000

N 227500

N 228000

N 228500

N 229000

N 229500

NOTE-
Monument Discs are Stamped with Letter and Year Set
Discs in Ledge & Wall Stamped with Letter Year.

CREST MONUMENTATION

SURVEY RECORD

TITLE: SETTLEMENT MONUMENTS

LOCATION: BALL MOUNTAIN DAM, VT.

DATUM: M S L — **CONTOUR INTERVAL** —

SCALE: 1" = 100' — **DATE:** APRIL 1973

REF. BK. FC 230, 300 — **PARTY:** McNeal

DWG. NO. — **SHEET NO.**

PLATE 2-6

portion of this reach approaching 55 feet/mile. Characteristically, the upper portion of this reach also has a very narrow channel with steep side slopes and a rapidly meandering flow pattern. The river below Townshend Lake flows in a meandering fashion with an average gradient of 13 feet/mile to the Connecticut River. The Connecticut River from the West River to Vernon Dam is much flatter with an average slope of 2 feet/mile. During times of low flow in the West River, Vernon Dam creates a backwater effect which extends upstream into the West River and controls flows at its lower end. During high flows, however, the natural constriction at the end of the West River and its perpendicular junction with the Connecticut River is the hydraulic control section for flows in the lower end of the West River. The West River is crossed by four State highways, US Route 5, two Boston & Maine Railroad lines, and four local roads. In addition, there are three dams below Ball Mountain Lake. In downstream order, they are: Townshend Lake Dam, West Dummerston Dam, and Vernon Hydroelectric Project.

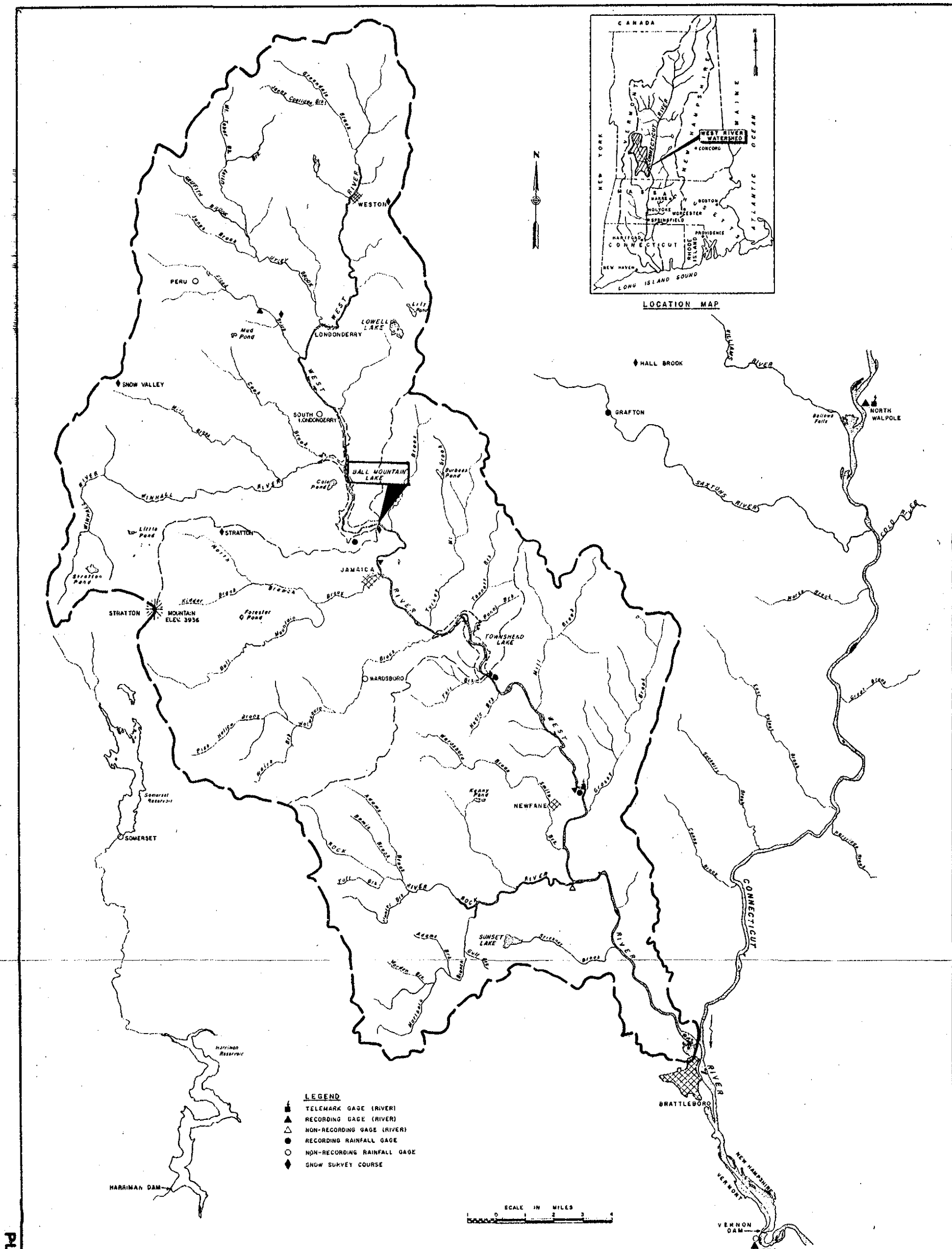


PLATE 2-1

CONNECTICUT RIVER FLOOD CONTROL
WEST RIVER
WATERSHED MAP
DEPARTMENT OF THE ARMY - NEW ENGLAND DIVISION
CORPS OF ENGINEERS - WALTHAM, MASS.
FEBRUARY 1973

CORPS OF ENGINEERS

U. S. ARMY

N. 245,000

N. 235,000

N. 225,000

E. 429,000

E. 419,000

E. 409,000

N

WINDHAM
LONDONDERRY

To Route No. 11

LIMIT OF FLOWAGE EASEMENT

LIMIT OF GOVERNMENT OWNED LAND

Flow line at spillway crest El. 1017.0'

LOWELL LAKE

To North Wilmington

BROOK

WEST RIVER

RELOCATED
STATE AID ROAD

WINHALL
RECREATION AREA

SOUTH
LONDONDERRY

To Londonderry

To Jamaica

COLE POND

RELOCATED
COLE POND ROAD

LONDONDERRY
JAMAICA

WINHALL
RIVER

RAWSONVILLE

To Bellows Falls

RAILROAD
(Abandoned)

WEST
RIVER

Cobb
Brook

VERMONT

DAM

BALL
MOUNTAIN

SHATTERACK
MOUNTAIN

PUBLIC USE AREA

WEST RIVER
RECREATION AREA

JAMAICA

To Townshend
& Brattleboro

Bell Mt. Brook

ACCESS ROAD TO DAM

OPERATOR'S QUARTERS

To Brattleboro

RESERVOIR PLAN

SCALE 1" = 1000'

1000 0 1000 2000

LEGEND

- Limit of Flowage Easement
- Limit of Government Owned Land
- Existing numbered routes
- Existing State Aid Road
- Existing Town gravel roads
- Completed highway relocation or improvement
- Reservoir flowage area at Spillway crest El. 1017.0
- Existing electric service and telephone lines have been relocated or abandoned
- Reserved for project operation
- Public Day-Use Areas
- Balance of Reservoir for fish and game management and public hunting and fishing.
- Road (Former R.R. Bed)

NOTES

Rising Pool Barrier

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.B.P. | DR. BY H.B.P. | CK. BY W.F.M.C.

SUBMITTED BY CHIEF, ENGINEERING DIVISION

RECOMMENDED CHIEF, O & M DIVISION

APPROVED CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL

BALL MOUNTAIN RESERVOIR

RESERVOIR MAP

WEST RIVER VERMONT

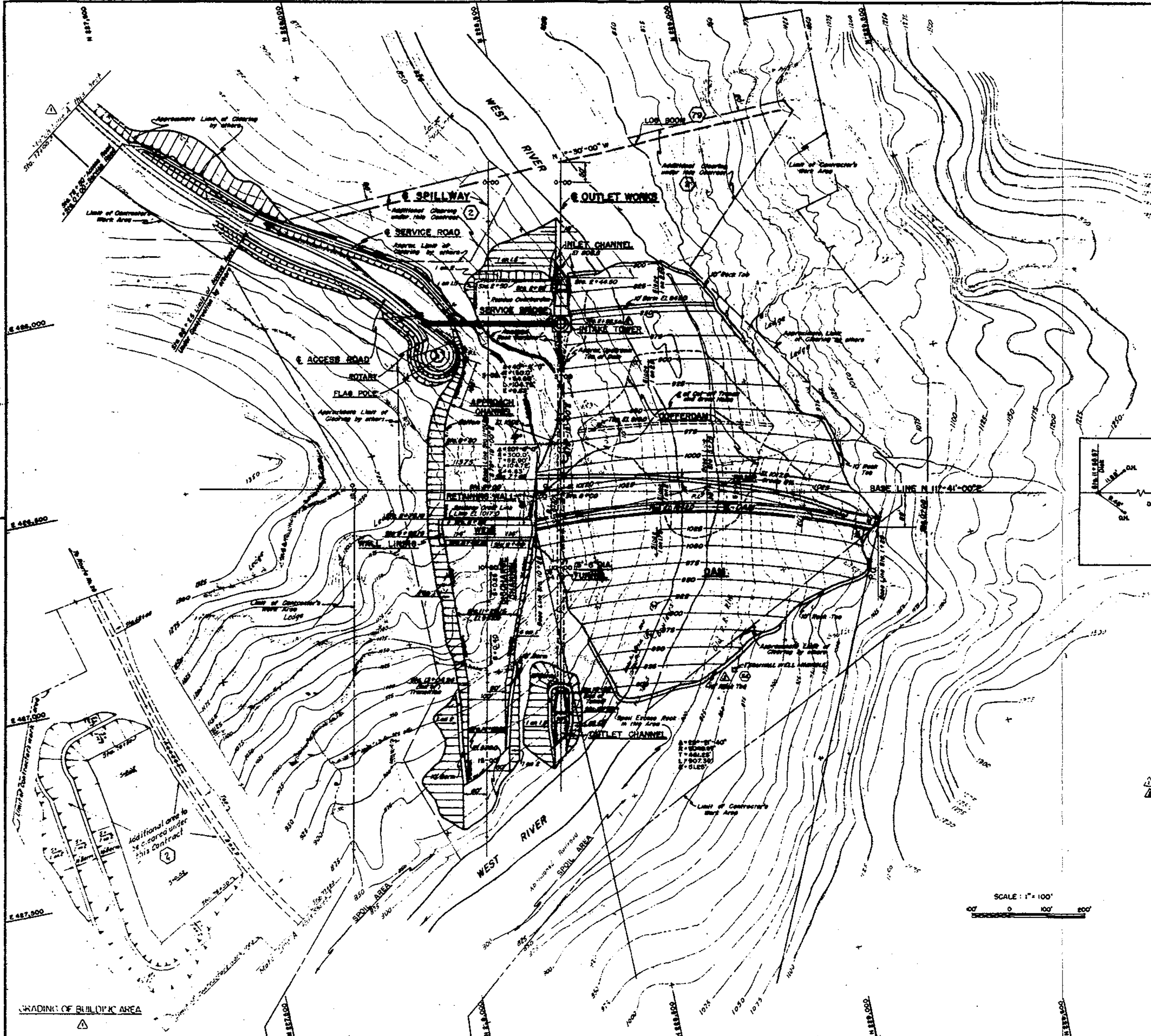
DATE MARCH 1961

SCALE

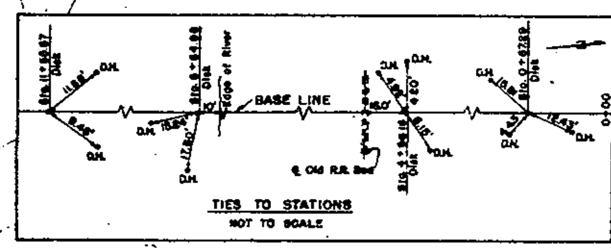
DRAWING NUMBER
CT-1-5659

SHEET 4 OF 12

PLATE 2-2



BASE LINE HORIZONTAL AND VERTICAL CONTROL				
STATION	NORTH	EAST	ELEV.	DESCRIPTION
0 + 67.29	229,343.37	426,868.64	1088.95'	Brass Disk Set in Ledge
4 + 98.18	229,981.44	426,779.39	881.19'	Brass Disk Set in Ledge
8 + 84.86	229,759.10	426,745.63	806.84'	Brass Disk Set in Ledge
11 + 58.57	228,277.63	426,846.26	1103.92'	Brass Disk Set in Ledge



Record Drawing
Contract No. DA-19-016-CIV ENG 57-294

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval 5 feet.,
Grid system based on Vermont State Mercator Datum.
Figures in hexagons indicate item numbers under which payments will be made.
For Embankment Sections and Details see Sheet Nos. 20, 21 and 22.
For Spillway and Outlet Works, see Sheet No. 23
For Service Bridge, see Sheet Nos. 73 thru 76.
For extension of Access Road and Service Road, see Sheet No. 77.
For Log Boom Details, see Sheet No 22.
⚠1 For grading of Building Area see detail plan, Sheet No. 35
For Limits of Contractor's Work Area see Sheet No. 86
⚠ For Layout and Details of Piezometer System see Sheet Nos. 87 and 88.
For Detailed Plan of Parking Area see Sheet No 77

REVISION	DATE	DESCRIPTION	BY
	10-31-63	[illegible]	
⚠	[illegible]	TERMINAL WELL MANHOLE & Note added.	
⚠	3/25/58	℄ Sta. of Intake Tower and Service Bridge change.	
⚠1	3/30/57	[illegible]	

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON MASS

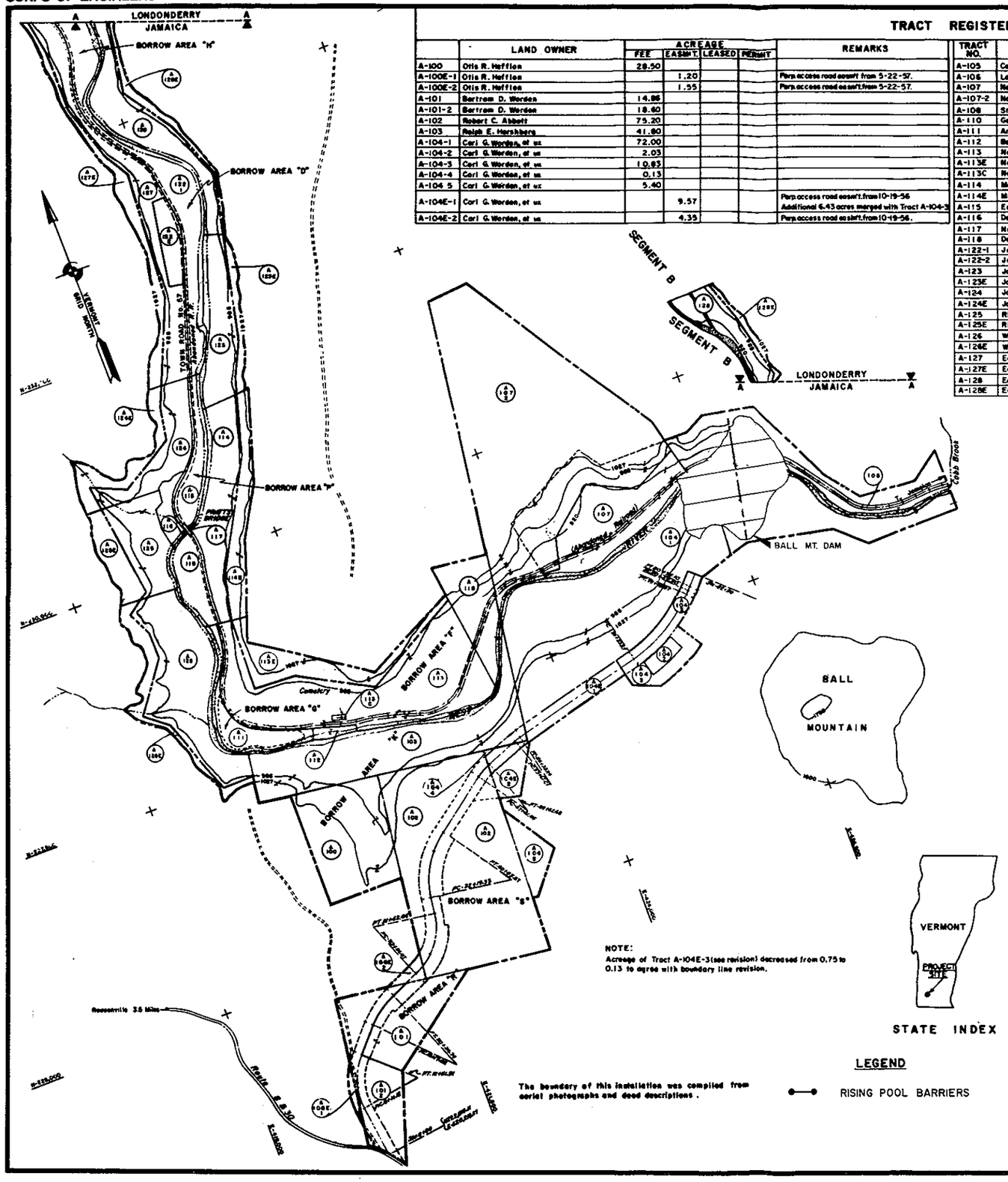
DES. BY D.W.C. | TR. BY M.S. | CK. BY W.Z.

PROJECT ENGINEER
SUBMITTED BY
APPROVED
CHIEF ENGINEERING DIV.
APPROVED
LT. COL. C.E. ASST. DIVISION ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN DAM
GENERAL PLAN
WEST RIVER VERMONT
DATE FEB. 1957
SCALE AS SHOWN
DRAWING NUMBER CT-1-4172
SHEET 19

CORPS OF ENGINEERS

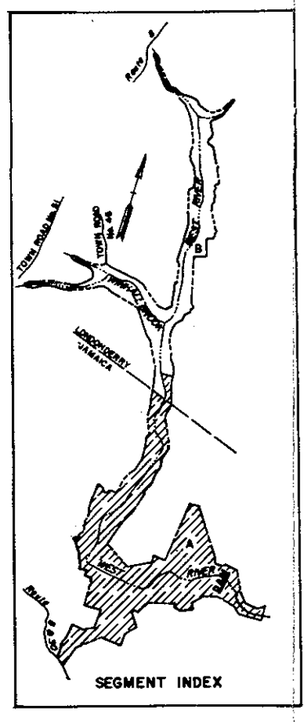
U. S. ARMY



TRACT REGISTER

	LAND OWNER	ACREAGE FEE	EASM'T.	LEASED	PERMIT	REMARKS
A-100	Otis R. Hoffion	28.50				
A-100E-1	Otis R. Hoffion		1.20			Perp. access road easm't from 5-22-57.
A-100E-2	Otis R. Hoffion		1.55			Perp. access road easm't from 5-22-57.
A-101	Bertram D. Worden	14.86				
A-101-2	Bertram D. Worden	18.60				
A-102	Robert C. Abbott	75.20				
A-103	Ralph E. Hershberg	41.80				
A-104-1	Carl G. Worden, et ux	72.00				
A-104-2	Carl G. Worden, et ux	2.03				
A-104-3	Carl G. Worden, et ux	10.83				
A-104-4	Carl G. Worden, et ux	0.13				
A-104 5	Carl G. Worden, et ux	5.40				
A-104E-1	Carl G. Worden, et ux		9.57			Perp. access road easm't from 10-19-56 Additional 6.43 acres merged with Tract A-104-3
A-104E-2	Carl G. Worden, et ux		4.35			Perp. access road easm't from 10-19-56.

TRACT NO.	LAND OWNER	ACREAGE FEE	EASM'T.	LEASED	PERMIT	REMARKS
A-105	Carsonimo Lumber Company, Inc.	31.00				
A-106	Lewis H. Stowell, et ux	26.10				
A-107	Norman L. Hunt, et al	23.80				
A-107-2	Norman L. Hunt, et al	76.20				
A-108	State of Vermont	3.80				
A-110	George J. Behake, et ux	7.00				
A-111	Arthur R. Wolfe	8.36				
A-112	Bertil Oscarson, et ux	1.37				
A-113	Norman L. Hunt	54.40				
A-113E	Norman L. Hunt		13.20			Perp. flowage easm't. from 12-10-57.
A-113C	Norman L. Hunt, et al.	0.04				Formerly known as Tract A-119.
A-114	Maurice R. Landers	20.80				
A-114E	Maurice R. Landers		10.73			Perp. flowage easm't. from 12-10-57.
A-115	Ernest W. Seffen, et ux	12.00				
A-116	Dennis Lumber Company, Inc.	3.79				
A-117	Norman L. Hunt	0.07				
A-118	Dewey W. Hunt	13.60				
A-122-1	John E. Dowden, et ux	23.00				
A-122-2	John E. Dowden, et ux	9.34				
A-123	Joseph J. Whelan, et ux	14.90				
A-123E	Joseph J. Whelan, et ux		4.00			Perp. flowage easm't. from 10-5-59.
A-124	John L. Barry, Jr., et ux	12.00				
A-124E	John L. Barry, Jr., et ux		6.90			Perp. flowage easm't. from 1-29-60.
A-125	Richard N. Hargrave, Jr.	13.00				
A-125E	Richard N. Hargrave, Jr.		6.50			Perp. flowage easm't. from 1-29-60.
A-126	W. George Bissett, et ux	31.00				
A-126E	W. George Bissett, et ux		6.90			Perp. flowage easm't. from 10-19-59.
A-127	Edward J. Dennis, et ux	22.20				
A-127E	Edward J. Dennis, et ux		8.85			Perp. flowage easm't. from 1-19-60.
A-128	Edward J. Dennis, et ux	30.70				
A-128E	Edward J. Dennis, et ux		6.60			Perp. flowage easm't. from 1-19-60.



FINAL

PROJECT MAP

DEPT. OF THE ARMY

USING SERVICE CORPS OF ENGINEERS
CIVIL WORKS

LOCATION OF PROJECT

STATE VERMONT

COUNTY WINDHAM

DIVISION NEW ENGLAND

DISTRICT

ARMY AREA FIRST

15 MILES W OF BELLOWS FALLS

15 MILES E OF MANCHESTER

TRANSPORTATION FACILITIES

RAILROADS

STATE ROADS R. 30

FEDERAL ROADS

AIR LINES

ACQUISITION

TOTAL ACRES ACQUIRED 1226.94

FEE 964.51

PUBLIC DOMAIN — WITHDRAWAL

PUBLIC DOMAIN — USE PERMIT

USE PERMIT (OTHER THAN P. D.)

TRANSFER

LEASE

LESSEE INTERESTS — EAS 262.43

DISPOSAL

TOTAL ACRES DISPOSED OF

SOLD

PUBLIC DOMAIN — WITHDRAWAL

PUBLIC DOMAIN — USE PERMIT

USE PERMIT (OTHER THAN P. D.)

TRANSFERRED

LEASES TERMINATED

LESSEE INTERESTS TERM.

REASSIGNED

OTHER

LEGEND

EXCEPT FOR THE SPECIAL SYMBOLS SHOWN BELOW MAP SYMBOLS ARE STANDARD IN ARMY MAP SERVICE TECHNICAL MANUAL NO. 23.

RESERVATION LINE

RESERVATION LINE (Actual Survey)

TRACT BOUNDARY LINE

TRACT NUMBER

CONTOUR LINE

DISPOSAL

EXTENDED OWNERSHIP LINE

ACQUISITION AUTHORIZATION

3rd Ind. OCE to NED, dated 1-28-57.
Public Law 780, dated 9-3-54.
Public Law 534, dated 12-22-44.

SEGMENT A

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DRAWN BY
TRACED BY
CHECKED BY
SUBMITTED BY
RECOMMENDED BY
APPROVED BY

REAL ESTATE

BALL MOUNTAIN LAKE

PROJECT LANDS & ROAD BARRICADES

DATE FEB 1976

OFFICE, CHIEF OF ENGINEERS, WASHINGTON 25, D. C.
AUDITED OCE APPROVED 1-18-72

INSTALLATION OR PROJECT NO. NED-2-0002

SCALE 1" = 500'

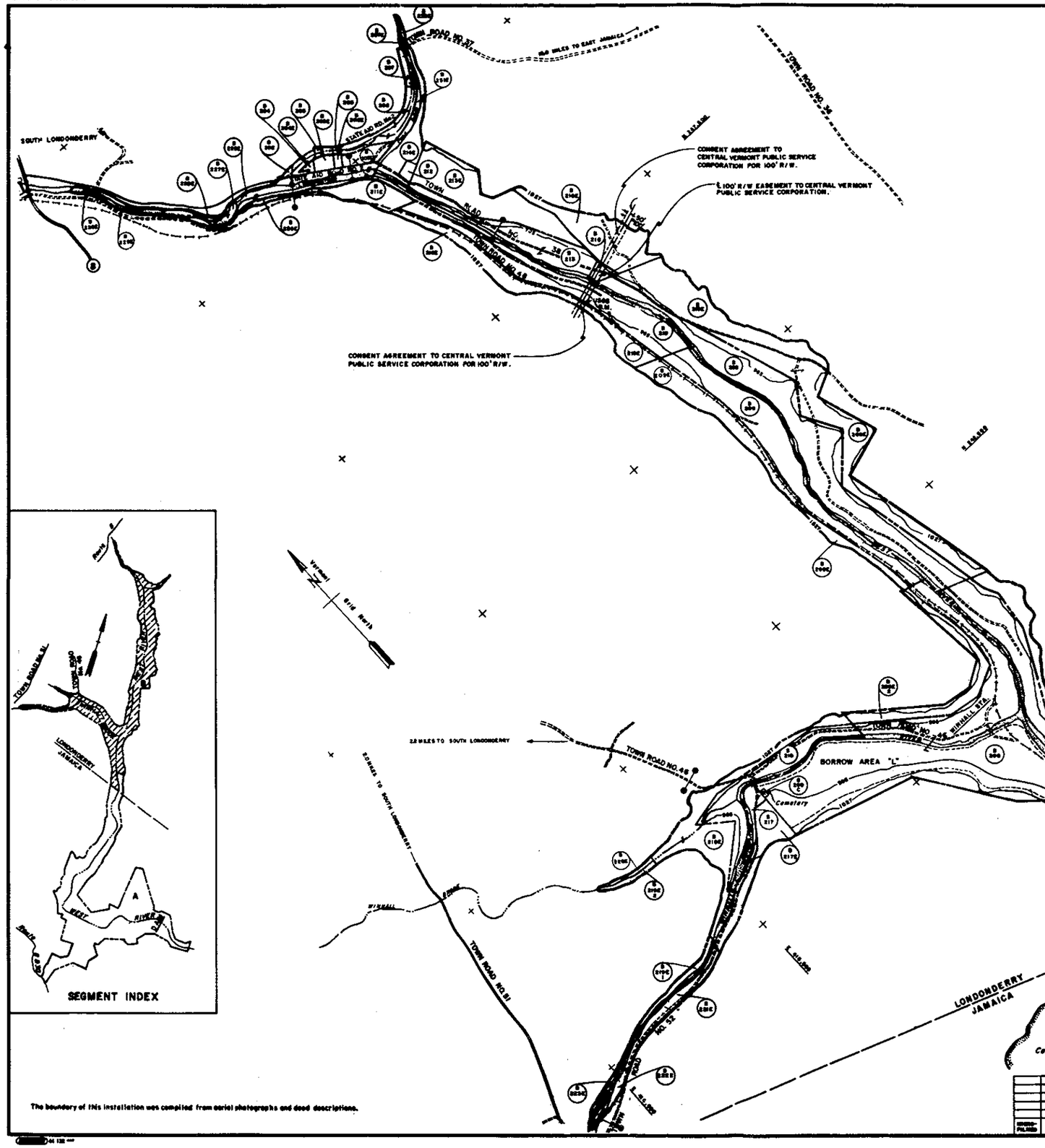
SHEET 1 OF 2 SHEETS — DRAWING NO. 1872

	DATE	REVISIONS	BY
	2-25-76	Superseades Drawing No. NED PA-870, Sheet 1 of 2.	
	8-28-71	Due to Final Audit.	
	6-7-71	Title changed-ER 1120-2-111, dated 5-17-71.	
	6-11-64	Revised for Tracts A-104E, A-108E-1, A-108E-2, A-103E, A-104E-2 and A-107E deleted; A-104E merged with A-104 and A-104-2; A-108E-2 and A-103E-2 merged with A-108; A-103E merged with A-103; A-104E-3 merged with A-104-4 (see note); A107E merged with A-107-2.	
	6-18-60	Tract A-101-2 added.	

PLATE 2-4a

CORPS OF ENGINEERS

U. S. ARMY



The boundary of this installation was compiled from aerial photographs and deed descriptions.

TRACT REGISTER

TRACT NO.	LAND OWNER	ACREAGE FEE	ACREAGE EASM'T.	ACREAGE LEASED	ACREAGE PERMIT	REMARKS
B-200	Edwin Stein, et ux	88.00				Includes all of Tract B-200C (0.01 of an acre)
B-200E-1	Edwin Stein, et ux		6.30			Perp. flowage easm't from 6-11-59
B-200E-2	Edwin Stein, et ux		8.60			Perp. flowage easm't from 6-11-59
B-201	Norman L. Hunt, et ux	1.87				
B-202	Walter J. Kerwyan, et ux	0.24				
B-203	James Tyler Paine	0.48				
B-203E	James Tyler Paine		1.00			Perp. flowage easm't from 5-15-59
B-204	Harry Sparks, et ux	0.98				
B-204E	Harry Sparks, et ux		0.40			Perp. flowage easm't from 2-28-58
B-205	Lewis F. Slade, et ux	0.83				
B-206E	Lewis F. Slade, et ux		0.36			Perp. flowage easm't from 12-26-57
B-206	Franklin E. Slade, et ux	3.35				
B-206E	Franklin E. Slade, et ux		2.2			Perp. flowage easm't from 4-15-59
B-207	Sidney Magee, et ux	0.88				
B-208	Harry Stanton Kimberly, et ux	42.20				
B-208E	Harry Stanton Kimberly, et ux		23.00			Perp. flowage easm't from 2-25-58
B-209	Oliver Claxton, et ux	23.00				
B-209E	Oliver Claxton, et ux		12.90			Perp. flowage easm't from 6-11-58
B-200C	Edward Stein, et ux (Cemetery)					Acreage (0.01 A.) included in Tract B-200
B-210	S. Wesley Davis, et ux	24.70				
B-210E	S. Wesley Davis, et ux		13.00			Perp. flowage easm't from 3-5-59
B-211E	Lester B. Derby		5.74			Perp. flowage easm't from 5-19-59
B-212	Ralph E. Hershberg, et ux.	0.74				
B-213	Earl R. Melendy, et ux	11.82				
B-213E	Earl R. Melendy, et ux		17.82			Perp. flowage easm't from 5-10-55
B-214E	Howard L. Mason, et ux		5.00			Perp. flowage easm't from 3-4-59
B-215E	Gerald G. Walker, et ux		17.00			Perp. flowage easm't from 8-28-59
B-216	William R. Burdick, et al	1.16				
B-216E	William R. Burdick, et al		12.00			Perp. flowage easm't from 1-29-60
B-217	John Borris, et ux	2.90				
B-217E	John Borris, et ux		4.00			Perp. flowage easm't from 7-24-59
B-218	Herbert O. Smith, et ux	14.35				
B-218E	Herbert O. Smith, et ux		18.00			Perp. flowage easm't from 6-11-59
B-219E-1	Edwin Stein, et ux		2.80			Perp. flowage easm't from 5-8-59
B-219E-2	Edwin Stein, et ux		0.80			Perp. flowage easm't from 5-8-59
B-220E	Nelson M. Smith, et ux		0.63			Perp. flowage easm't from 4-24-59
B-221E	Rex C. Doane, et ux		4.30			Perp. flowage easm't from 4-24-59
B-222E	Isabel A. Cohen		1.55			Perp. flowage easm't from 1-29-60
B-223E	Laura O. Seeley, et al		1.20			Perp. flowage easm't from 1-29-60
B-224	Joseph J. Whalen, et ux.	33.80				
B-224E	Joseph J. Whalen, et ux.		9.75			Perp. flowage easm't from 10-5-59
B-225E	Lee H. Gale, Estate		6.90			Perp. flowage easm't from 1-29-60
B-226E	Edward C. Walker, et ux		0.41			Perp. flowage easm't from 9-17-59
B-227E	Carl H. Wiley, et ux		3.70			Perp. flowage easm't from 9-23-59
B-228E	Edward G. Janaway		0.37			Perp. flowage easm't from 9-29-59
B-229E	Kenneth Thomas, et ux		0.46			Perp. flowage easm't from 9-17-59
B-230E	A. Harriett Davis		0.08			Perp. flowage easm't from 9-18-59
B-231E	Town of Londonderry		1.35			Perp. flowage easm't from 3-14-60
B-232E	Elizabeth Hudson Magee		0.20			Perp. flowage easm't from 12-23-59
B-207E	Sidney Magee		0.58			Perp. flowage easm't from 12-23-59

2-23-76	Supersedes Drawing No. NED PA-870, Sheet 1 of 2.	
6-28-71	Due to Final Audit.	
6-7-71	Title changed - ER 1180-2-111, dated 2-17-71.	

PROJECT MAP (CONTINUATION SHEET)

DEPT. OF THE ARMY — LOCATION OF PROJECT
STATE VERMONT
COUNTY WINDHAM
MI. NEW ENGLAND
RIVER
ABOUT 40th FIRST
15 MILES W OF BELLOWS FALLS
15 MILES E OF MANCHESTER

CORPS OF ENGINEERS — TRANSPORTATION FACILITIES
RAILROADS
STATE ROADS
TOWN ROADS
OTHER

SEGMENT B

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DRAWN BY
TRACED BY
CHECKED BY
SUBMITTED BY
RECOMMENDED BY
APPROVED BY — DATE FEB 1976

REAL ESTATE

BALL MOUNTAIN LAKE

PROJECT LANDS & ROAD BARRICADES

AUDITED OCE APPROVED 1-18-72

DIVISION OR PROJECT NO. NED-2-0002

SHEET 2 OF 2 SHEETS — DRAWING NO. 1875

PLATE 2-4b

LOCATION OF STRONG MOTION INSTRUMENTATION

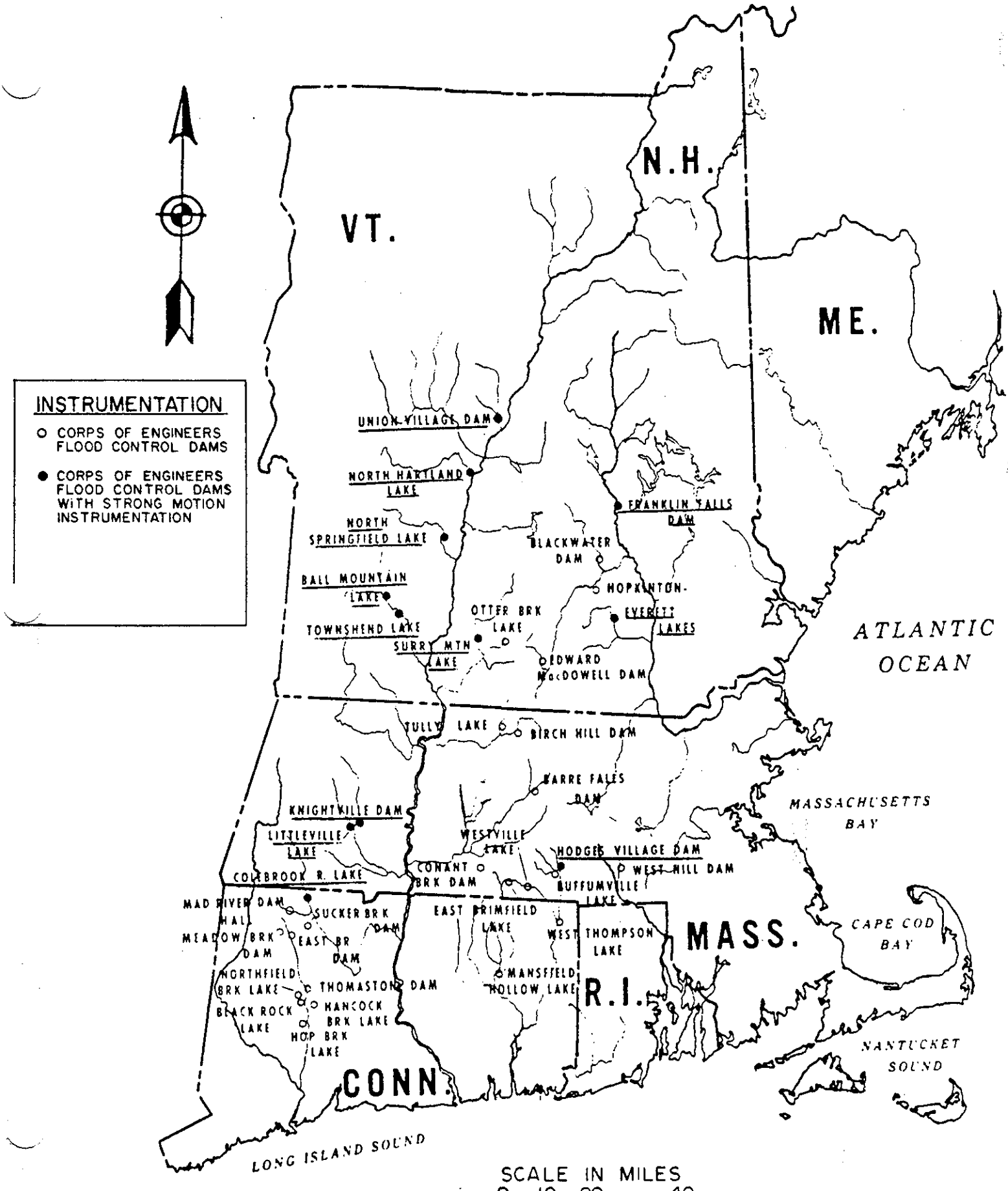


PLATE 2-5

3. PROJECT STAFF

Ball Mountain Lake is manned during the week days by a Project Manager who has the overall responsibility for operation and maintenance of the project area. In addition, an Assistant Project Manager assists on a full-time basis. Ball Mountain Lake is one of seven projects located in the Upper Connecticut River Basin. The Basin Manager is located at North Springfield Lake in Springfield, Vermont, approximately 25 miles from Ball Mountain Lake. Should the Project Manager or his Assistant be unavailable because of illness or other circumstances, assistance could be provided by the Project Manager and/or his Assistant located at Townshend Lake, 5 miles from Ball Mountain Lake. Future reference to "Project Manager" in this report means the designated Project Manager or an individual in charge (i.e., Assistant Project Manager, Basin Manager or other designated representative) of Ball Mountain Lake.

4. COMMUNICATIONS

a. Reports From Corps Projects - The New England Division radio network consists of a link from Division Headquarters in Waltham to various transmitters and relay facilities, which transmit voice signals to and from staffed reservoirs.

In addition to those base station radios, Corps projects are equipped with mobile radios to permit contact with Waltham Headquarters by field personnel during reconnaissance activities. Likewise, headquarters is also equipped with mobile radios.

Voice communications between Project Managers and Reservoir Control Center are normally made via the Division radio network during normal work hours or whenever headquarters is staffed. Whenever the radio network is inoperative or during nonwork hours, reports and instructions are issued via telephone. In the event of failure of the radio network and telephone service, emergency communications will be attempted through State Police or Civil Preparedness radio facilities (Plate 7-7).

In the event of complete communication failure with Reservoir Control Center, the Project Manager can perform limited operations as referenced in Master Water Control Manual, Appendix D, paragraph 28.

b. Precipitation Reporting Network - Reports of precipitation data from the West River watershed are used primarily for the purpose of alerting Reservoir Control Center personnel and for providing a basis for appraising the severity of the storm. Collection and reporting of precipitation data from Ball Mountain Lake is the responsibility of the Project Manager who may also receive calls from observers in the watershed.

The Northeast River Forecast Center in Bloomfield, Connecticut, receives precipitation reports from observers in and near the West River watershed, which are made available to Reservoir Control Center upon request. In addition, cooperative daily reporting procedures from most Corps dams have been established with the River Forecast Center and have been detailed in separate memos to each Project Manager.

c. River Reporting Network - A network of river stage observation stations, which is part of an overall river reporting system for the Connecticut River Basin, has been established. This network assists in the execution of the reservoir regulation plan by permitting personnel in Reservoir Control Center and at

the dams to obtain river stages at selected key index stations located on tributaries on the Connecticut River.

The Corps existing reporting system for regulating Ball Mountain Lake includes the following locations;

USGS gage at Jamaica, VT
* USGS gage at Newfane, VT (802-365-4071)
*+ USGS gage at Montague City, MA (413-779-4916)

* Telemark Equipped
\+ NEDSAT DCP Site

d. Automatic Data Collection - The effective regulation of 35 flood control dams in the New England Division requires a rapid method of collecting and coordinating hydrologic data by the Reservoir Control Center. Consistent with this requirement, Reservoir Control Center maintains an Automatic Data Collection and Reporting Network (NEDSAT). NEDSAT presently consists of 43 remote reporting stations and one ground receive station at New England Division headquarters. The remote reporting stations are situated at selected USGS and NWS gages monitoring streamflow and precipitation data. This information is transmitted to NOAA's Geostationary Operational Environmental Satellite (GOES) and then retransmitted to the ground receive station in Waltham.

During normal conditions, data transmission from the stations will occur about 2 to 5 times a day. However, the frequency of data transmission increases as hydrologic conditions worsen, occurring as often as several times an hour for severe conditions. Data collection platforms (DCP's) at the reporting stations contain uninterruptible power supplies (UPS). The UPS allows the station to continue to operate after the normal power supply is interrupted, as in the case of major storms or hurricanes. Batteries used in the UPS are charged by commercial AC power thermoelectric generators or solar panels and can provide sufficient energy to operate up to 3 weeks without recharging, depending on system activities.

5. EMERGENCY IDENTIFICATION SUBPLAN

a. General - The object of this subplan is to describe procedures and means for assuring reliable identification and evaluation of existing or potential emergencies.

The failure of Teton Dam and other non-Corps dams has demonstrated the alarming short period of time it takes for a dam to breach, the destructive potential of the uncontrolled release of water and the importance of an effective and expeditious notification of the public in minimizing loss of life and/or property. The Corps is committed to a program of dam safety, which includes the preparation of Flood Emergency Plans for our completed dam projects.

b. Possible Causes of Emergencies and Recent Studies - Various emergency situations may occur which adversely affect the dam's primary function of impounding water. As suggested by the 1980 Hydrologic Engineering Center guidelines on Flood Emergency Plans, these emergencies may be caused by one or a combination of the following events:

(1) Earthquake
(2) Landslide
(3) Extreme Storm
(4) Piping
(5) Equipment Malfunction
(6) Structural Damage
(7) Foundation Failure
(8) Sabotage or Enemy Attack

Recently completed studies and inspections as discussed below indicate that Ball Mountain Lake is in excellent condition and meets current engineering design criteria.

(1) Structural Stability of Concrete Structures - A structural stability analysis of the principal concrete structures at Ball Mountain Lake was performed by the Structural Unit, Engineering Division, in March 1984, to determine whether these structures satisfy current criteria. The principal features analyzed consist of the following: spillway weir, intake structure, service bridge piers, spillway training wall, and intake channel wall. This analysis indicated that all structures satisfied current criteria, and no remedial action was recommended.

(2) Embankment Stability Re-evaluation - The embankment stability of the dam has not been re-evaluated based upon current criteria as contained in EM 1110-2-1902, dated 1 April 1970.

(3) Seismic Stability - A preliminary seismic stability analysis was completed in August 1980 for the dam. This effort consisted of a pseudo-static earthquake stability analysis using three seismic coefficients. The seismic coefficient of 0.05 assigned for the seismic risk map zone 2, in which the dam is located, resulted in a minimum factor of safety of 1.40. For the seismic coefficient of 0.10 assigned for the next higher risk zone, a computed factor of safety of 1.28 was determined. Lastly, for a predicted peak acceleration of 0.18, which was based on historical epicenter data, resulted in a factor of safety of 1.13.

Since the completion of this preliminary seismic stability, the engineering regulation (ER 1110-2-1806) on earthquake analysis has been revised. The new regulation states that the pseudo-static method used in the preliminary seismic stability is no longer regarded as being appropriate for analysis of embankment of foundation response to seismic loading and, therefore, should be discontinued. However, at this time no further earthquake analysis is planned for the Ball Mountain Lake project.

(4) Periodic Inspection - The most recent Periodic Inspection Report No. 3 dated September 1984 found no major dam-related problems. Several minor items were noted: cracking and leakage in the outlet conduit, leakage noted from behind the handhole cover plate on gate No. 3, manual chain drive on overhead crane not working and automatic sump pump does not function automatically from the float switch. In addition, settlement of as much as 1.8 feet has occurred along the downstream side of the dam crest since 1963. A small bulge also exists in the rockfill about mid-height of the downstream slope. Both irregularities have been reported in previous periodic inspections and warrant still further evaluation. An instrumentation system for monitoring movement at the crest and downstream slope including additional survey monuments and inclinometers has been funded and will be installed in FY 85. In addition, test pits will be dug at several locations across the crest of the dam in an attempt to locate any possible failure planes.

(5) Ice Jam Flooding - One area along the West River that has had ice jam floods is a trailer camp in Jamaica, Vermont, downstream of Ball Mountain Lake.

Thus, the above studies and inspection results document that the probability of such a condition as an earthquake, piping, or foundation failure or other situations appears remote. An evaluation of the probability of occurrence for any of the previously cited emergency conditions would at best be very

speculative and thus not very constructive. In order to provide timely response to the distress caused by the condition, the early detection and identification of the change in condition of the project facilities is important.

c. Surveillance and Inspection

(1) Inspection of Floods - A condition which is of minor importance with relatively low reservoir levels may assume serious proportions with increasing pool levels, and the Project Manager must be constantly alert to note and report even minor failures or changes in the conditions of the embankment.

The Operations and Maintenance Manual for Ball Mountain Lake, chapter 2, paragraph d, states the Inspection During Floods requirement. The manual states that when the reservoir is filling or storing water, the Project Manager will inspect the exposed faces of the dam and dam abutments, particularly the downstream faces, for sloughs and springs. When the reservoir is being drawn down, the Project Manager will inspect the exposed faces of the dam and dam abutments, particularly the upstream face for slides. During any subsequent filling, storage and drawdown periods, inspection of the embankments shall be performed. Inspections shall be performed at least once a day when the pool is above elevation 940 feet. In addition, the Operation and Maintenance Manual requires that each time the reservoir is filling to a higher level than previously experienced (pool of record, elevation 1003.5 feet, 82 percent full, April 1969), inspection of the downstream faces of the dam shall be conducted at least twice daily during storage and at least three times weekly during drawdown until two weeks after completion of drawdown.

A practice is established within the Division whereby the experiencing of a certain pool elevation at a project will require that a reconnaissance of the project be performed by the geotechnical engineering staff of New England Division. Plate 5-1 shows the pool elevations requiring a reconnaissance inspection for all 35 New England Division projects. The pool elevation for Ball Mountain Lake is 1,003 feet.

(2) Unusual Event Other Than Floods - Inspections should be made after the occurrence of an unusual event, such as, but not limited to, earthquake, sabotage, equipment malfunction, and other emergency conditions. However, often times the creation of the condition may at the time be unknown, and therefore it is important to recognize signs of distress and the necessary action to be implemented.

(3) Guidance on Inspection Action - Plates 5-2a through 5-2i entitled "Signs of Distress" are to be used as a guide by the Project Manager for various types of observed conditions. Unless the dam is in imminent danger of failure, the Project Manager must coordinate all actions and notification with the Emergency Operations Center staff. Notification should follow procedures as outlined in the NOTIFICATION SUBPLAN (Section 7) of this report.

Plates 5-3a through 5-3d are an Inspection Checklist to be utilized by the predesignated technical Emergency Response Team which would inspect the dam for the emergency condition experienced. Due to the severity of a specific emergency condition, the Project Manager could be directed by Emergency Operations Center to complete this Inspection Checklist.

Plate 5-4 entitled "Description of Characteristic Effects for Earthquakes" is included to supplement the Inspection Checklist for descriptive categories on reporting an earthquake. Strong motion instruments which measure events greater than the triggering acceleration of 0.01g are available at the site and at Townshend Lake, Townshend, Vermont (5 miles distance). See Plate 2-5 for the location of these and other strong motion instruments in New England.

FLOOD CONTROL STUDIES - DATA SHEET

DATE _____

Reservoir	Placed in Operation	PREVIOUS HIGHEST RESERVOIR LEVELS								SELECTED RECONNAISANCE LEVEL			PRESENT LEVEL			
		Event	Elevation (ft,msl)	Stage (ft)	% Full	Event	Elevation (ft,msl)	Stage (ft)	% Full	Elevation (ft,msl)	Stage (ft)	% Full	Elevation (ft,msl)	Stage (ft)	% Full	Tendency
Union Village	1950	Apr 1969	534	114	53	Jun 1984	523.8	103.8	40	533	114	53				
North Hartland	1961	Apr 1969	519	129	64	Jun 1984	508.9	118.9	55	519	129	64				
North Springfield	1960	Apr 1969	530.8	78.8	69	Jul 1973	529.5	77.5	66	520	68*	50				
Ball Mountain	1961	Apr 1969	1003.5	198.0	82	Jun 1984	998.6	193.1	75	1003	198	82				
Townshend	1961	Feb 1981	539	82	70	Jun 1984	538.8	81.8	69	529	72*	50				
Surry Mountain	1941	Jun 1984	546.4	61.4	89	Mar 1948	542.6	57.6	78	542	57	78				
Otter Brook	1958	Jun 1984	771.7	88.7	82	Apr 1969	765.6	82.6	71	765	82	71				
Birch Hill	1941	Jun 1984	845.6	30.6	64	Mar 1979	841.6	26.6	46	840	25	40				
Tully	1949	Jun 1984	660.0	35.0	61	Apr 1960	657.3	32.3	50	657	32	50				
Barre Falls	1958	Jun 1984	799.7	-	64	Apr 1960	797.9	-	55	797	-	55				
Knightville	1941	Jan 1949	610.2	130.2	100+	Jun 1984	609.0	129.0	98	605	125	90				
Littleville	1965	Jun 1984	568.9	-	83	Mar 1980	551.8	-	51	549	-	46				
Colebrook River	1969	Jun 1984	757.5	-	90	Apr 1983	747.1	-	68	739	-	53				
Franklin Falls	1943	Mar 1953	375.7	75.7	76	Jun 1984	373.6	73.6	73	375	75	76				
Blackwater	1941	Apr 1969	561.5	46.5	74	Mar 1953	560	45	66	561	46	74				
Hopkinton	1962	Jun 1984	407.5	41.5)	59	Apr 1969	405.0	39.0)	44	405	39)	44				
Everett	1961	Jun 1984	405.5	80.5)		Apr 1969	397.1	72.1)		397	72)					
Edward MacDowell	1950	Jun 1984	943.2	39.2	85	Mar 1979	938.0	34.0	65	935	31	58				
Thomaston	1960	Jun 1984	467.2	87.2	50	Jun 1982	455.4	75.4	35	456	76*	35				
Black Rock	1970	Jun 1984	503.4	93.4	65	Jun 1982	494.5	84.5	50	490	80	42				
Hop Brook	1968	Jun 1982	349.9	57.9	53	Jun 1984	347.4	55.4	47	347	55	47				
Hancock Brook	1966	Jun 1982	477.4	23.4	58	Mar 1980	473.0	19.0	36	477	23	56				
Northfield Brook	1965	Jun 1984	547.9	67.4	40	Jun 1982	540.4	59.9	30	537	57	26				
Hall Meadow Brook	1962	Jun 1984	873.5	23.5	24	Mar 1979	870.6	20.6	18	870	21	18				
East Branch	1964	Jun 1984	836.8	38.8	29	Sep 1975	836.1	38.1	27	836	38	27				
East Brimfield	1960	Jun 1984	645.1	26.1	47	Jun 1982	643.2	24.2	37	644	25	41				
Westville	1962	Jun 1984	565.5	50.5	56	Mar 1968	564.0	49.0	48	564	49	48				
West Thompson	1965	Jun 1984	330.9	38.9	53	Mar 1968	329.5	37.5	48	329	37	48				
Hodges Village	1959	Mar 1968	488.9	23.4	43	Jan 1979	488.0	22.5	40	485	19*	29				
Buffumville	1958	Mar 1968	509.9	28.4	44	Jan 1979	508.7	27.2	40	509	28	44				
Mansfield Hollow	1952	Jun 1982	247.6	52.6	66	Aug 1955	246.8	51.8	65	245	50	59				
West Hill	1961	Mar 1968	258.3	24.3	60	Jan 1979	258.2	24.2	59	254	20*	38				
Conant Brook	1966	Jun 1984	720.0	27.0	16	Jun 1982	717.5	24.5	13	720	27	16				
Sucker Brook	1970	Dec 1973	906.2	25.2	24	Mar 1979	904.8	23.8	22	906	25	24				
Mad River	1963	Jun 1984	929.6	74.6	25	Mar 1980	922.3	67.3	19	922	67	19				

September 1984 Prepared by Geotechnical Engineering Branch and Water Control Branch

* Prior Seepage Problem

PLATE 5-1

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situtation Report	Remarks
1. SEEPAGE				
a. Wet area on downstream embankment slope or any other area downstream of the embankment, with very little or no surface water, or minor seeps.	This may be caused by infiltration of rain water which is not serious, or may be the start of a serious seepage problem, which would be indicated by a quick change to one of the conditions below.	None Required	Size and loacation of seepage area and approximate time condition is noted and quantity of surface water.	Observe periodically until sure that seepage does not change into one of the conditions noted below.
b. Same wet area as above, with moderate seeps of clear or relatively clear water	Not Serious - Clear seep water and rate of flow not increasing.	Try to measure rate of flow, inspect all downstream areas, and report any new seeps.	Size and location of seepage areas and time condition noted and approximate flow rate. Notify EOC.	When project is not storing flood waters and is acting as a dry reservoir, failure of the dam is very remote. During flood stages the seepage area must be periodically watched for critical developments.
	Could lead to Failure - relatively clear seep water, but rate of flow increasing.	Same as above.	Size and location of seepage area, time condition noted, and approximate flow rate. Notify Emergency Operations Center (EOC).	Same as above. During flood stages observe condition periodically, until otherwise notified.
c. Piping (Seepage with removal of material from foundation or embankment), moderate to active.	Could lead to Failure - Cloudy to muddy water and rate of flow is increasing.	Same as above. Place Inverted Filter over seepage area. If needed, use larger stones on top of filter. Use filter cloth at bottom if available. (Don't try to plug or stop flow of water). Also, consider lowering pool.	Size and location of seepage area, time that condition was noted and approximate rate of flow. Notify EOC.	Observe problem periodically until otherwise notified.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situtation Report	Remarks
c. Piping (Con't)	Failure Imminent - If along with piping there is an upstream swirl (whirlpool) caused by water entering at the abutments or through the embankment.	Same as above. If discharge tends to displace filter material use larger stones to control flow velocity; then place filter material and top with larger stones. Plugging of the upstream entrance of the pipe should be attempted (see Observed Condition 3 below). Also, consider lowering the pool.	Size and location of seepage area, time condition was noted and approximate flow rate; and location and approximate site of whirlpool. Notify EOC and if failure is in progress notify local officials and downstream residents.	Observe periodically.
d. Boils - Soil particles deposited around water exist forming a cone (Boils can vary from a few inches in diameter spaced 2 to 3 feet apart to isolated boils several feet in diameter).	Not Serious - Emerging water in developed cone is clear and rate of flow is not increasing.	Check all downstream areas other boils or seeps, and report to EOC.	Size & location of seepage area, time condition was noted and approximate flow rate.	Observe periodically until otherwise notified.
	Could Lead to Failure - If emerging water is muddy and rate of flow is increasing.	Consider lowering the pool. Temporarily control the seepage by ringing the area with a sandbag dike (See Plate 6-3 for schematic of ringing a boil). The dike should be constructed to provide sufficient flow reduction to prevent loss of material at surface. A low place must be left on the dike for a spillway on the side toward natural drainage. If boils become so large that it is not practical to dike around them, place an inverted filter over the area, but do not stop flow of water.	Size & location of seepage area, time condition was noted and approximate flow rate. Notify EOC.	Observe constantly until otherwise notified.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide for For Action	Data to be Reported in Situation Report	Remarks
d. Boils (Con't)		ERT to consider installing well points or other system to relieve below ground pressures		
	Failure Imminent-If emerging water is muddy, rate of flow increasing, and if there is an upstream swirl (whirlpool) caused by water entering at the abutments or through the embankment.	Same as above. Plugging of the upstream entrance of the pipe should be attempted (See observed condition 5 below). Lower the pool.	Size & Location of seepage area, time condition was noted and approximate flow rate; and location and approximate size of whirlpool. Notify EOC and if failure is in progress notify local officials.	Observe constantly
2. SINKHOLES				
a. Above piping tunnel in foundation or embankment.	Could Lead to Failure- If problem occurs in conjunction with piping or boils problem.	If in conjunction with boils problem, place inverted filter material in sinkhole (See 1.c and 1.d above). Check area for other sinkholes or seeps, and report to EOC.	Size and location of sinkhole and seepage area and approximate flow rate. Notify EOC.	Observe periodically until otherwise notified.
b. Above Outlet works conduit	Could Lead to Failure - If conduit cracks or structural damage.	Check conduit for cracks or damage and repair as soon as possible in coordination with guidance provided by Emergency Response Team (ERT).	Same as above plus description and size of cracks or damage and seepage into conduit.	Observe periodically.
3. RESERVOIR/WHIRLPOOLS	Usually caused by water flowing through a piping tunnel through the embankment or abutment.	Open outlet gates to lower the pool after contacting EOC. An attempt should be made to plug the entrance with large rock or anything else that is available.	Time condition noted, location noted, location, and approximate size of whirlpool and the exit area downstream.	Observe constantly for changes in the reservoir or the exit area.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situtation Report	Remarks
3. RESERVOIR/ WHIRLPOOLS (Con't)	Note:During high pools when completely submerged, debris may come together above the intake, due to intake flow, and move in a rotating motion. If there is no evident downstream exit of piping, and the rotating debris is over the intake structure, then it can be assumed there is no piping failure.	Use riprap from the face of the dam, or any large rock, or other large material. If the large material placed in the hole appears to have reduced the flow, follow with progressively smaller material. When flow is sufficiently reduced place inverted filter over the downstream outlet of piping as noted above in problem 1.c, Piping. Search abutments dam, and downstream of dam for seepage areas, sinkholes, boils etc.	Notify EOC and if failure is in progress notify local officials and downstream residents.	
4. SLIDES- Upstream or downstream slope of embankment for dam & dikes.	Not serious- If slide does not obstruct normal flow or intersect the crest and does not extend into the embankment more than five feet (measured perpendicular to the slope).	Coordinate any necessary work with Emergency Response Team (ERT).	Location, time first noticed, subsidence or bulging, whether water is emerging from slope, whether any movement can be visually detected and pool elevation.	Observe periodically.
	Could Lead to Failure - If slide passes through the crest, and water surface is more than 10 feet below the lowered crest.	Coordinate with EOC or ERT as to the proper remedial action. Start lowering pool by coordinating with RCC.	Report same data as above. Notify EOC.	Observe periodically until necessary repairs are completed.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be Reported in Situation Report	Remarks
4. SLIDES (Con't)	Failure Imminent-If (1) the slide passes through the crest and (2) the water surface is at or near (less than ten feet below) the top of the lowered crest.	Start lowering the pool. Use every means possible to armor the crest and to restore lost freeboard.	Location, time first noticed, whether water is emerging from slope, whether any movement can be visually detected and pool elevation. Notify EOC and if failure is in progress, notify local officials and downstream residents.	Same as above.
5. CRACKS				
a. Embankment	Not serious - If minor longitudinal crack in crest. If crack does not extend completely through the dam and lake water is more than ten feet below the base of the cracks.	Coordinate repair work with ERT.	Location, width, length and pattern (horizontal, vertical or in some intermediate direction). Pool elevation.	Observe periodically until repair work is complete. NOTE: Although cracks can develop anywhere in the embankment, the most likely location is in the area over the valley abutment contact zone.
	Could Cause Failure - If crack extends completely through the dam and lake water is at or near (less than ten feet) the base of the crack.	Coordinate with ERT. Backfilling or other means of filling the crack will be required after the extent of the crack is determined.	Same as above. Notify EOC.	Observe periodically until repair work is completed.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situation Report	Remarks
5. CRACKS (Con't)				
a. Embankment (Con't)	Failure Imminent - If crack extends completely through the dam and water is entering the crack and emerging on the downstream side.	Plug the crack on the upstream side to the extent possible using spalls and gravel before adding bentonite or impervious material. This procedure will help prevent the washing out of the finer materials through the crack. The work should be started nearest the water surface on the upstream side. If the crack cannot be plugged from the upstream side, then plugging should be attempted from the downstream side with an inverted filter to prevent erosion of embankment materials. Start lowering the pool if (1) the water is less than ten feet below the base of the crack or (2) if the water is entering the crack and emerging on the downstream side.	Location, width, lengths and pattern of crack; also flow rate at downstream exit. Notify EOC and if failure is in progress notify local officials and downstream residents.	Same as above.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be Reported in Situation Report	Remarks
5. CRACKS (Con't)				
b. Concrete Structures	Not Serious - If cracks in conduit are 1/8 inch or less and are not changing. Seepage is constant and water clear.	Coordinate any necessary repair work with ERT.	Location, width, length and seepage conditions. Nofity EOC.	Observe periodically
	Could Lead to Failure - If width of crack or hole is changing, seepage is increasing and water carrying material.	Crack should be plugged with oakum or other suitable material until final repairs can be made.	Report same as above along with an estimate of the material being carried. Notfiy EOC.	Observe periodically until flow is controlled.
	Failure Imminent - Width of crack is increasing. Seepage is increasing and water carrying embankment material.	Plug the crack to the extent possible. Initial material should be larger than the crack width. Lower the pool as soon as possible.	Location, when noticed, estimate of water flow and material being carried. Possible sources of material and if water inlet is visible in pool area and pool elevation. Notify Emergency Operations Center (EOC) and if failure is in progress notify local officials and downstream residents.	Same as above.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situation Report	Remarks
6. RIP-RAP OR OTHER SLOPE PROTECTION FAILURE	Not Serious - If erosion is minor and pool is at a low level.	Repair work to be coordinated with ERT.	Elevation of damage; length of damage, in feet; pool elevation when damage occured.	Observe daily until repair is completed.
	Could Lead to Failure - If erosion at low or high pool level is severe.	Repair Using Rip-rap - Rip-rap may be dumped directly into the erosion scarp. The smaller stones will tend to settle to the lower portion of the stone mass, essentially creating a protective filter over the embankment soil. Coordinate repair with ERT. Temporary Repair Using Sand-bags - If rip-rap is depleted, sandbags may be placed in the scarped area. Each bag should be filled with sand and tied to prevent loss of material. Placement should be by hand, sling, or other methods that would prevent tearing of the bags. Bags filled with clay and silts may be used only if sand is not readily available and other methods of repair cannot be implemented.	Same as above, except notify Emergency Operations Center.	Same as above.

SIGNS OF DISTRESS

ACTION OF REPAIRS SHOULD ONLY BE INITIATED IF TIME IS OF ESSENCE DUE TO OBSERVED DISTRESS.
FOLLOW NOTIFICATION SUBPLAN

Observed Conditions	How to Evaluate Severity of Problem	Guide For Action	Data to be reported in Situation Report	Remarks
7. GATE FAILURE FOR OUTLET WORKS	If commercial power unavailable switch over to Emergency generator. If generator is not working, no manual backup exists for operation of the gates. If unable to lower gate, install stop logs on intake structure if pool elevation is low enough. Three gates are installed on the project, so if only one gate is inoperable, the other gates could be used for regulation purposes.	Coordinate any neccessary repair work with Emergency Response Team (ERT).	Cause of failure and condition of gate. Notify Emergency Operations Center (EOC).	Observe periodically until repairs are completed.
8. EARTHQUAKE	Consult Plate 5-4 for characteristic effects of various earthquakes. Utilize Checklist provided in Plates 5-3a through 5-3d.	Check other problem areas cited.	Notify EOC with checklist results. If failure is in progress notify local officials.	Observe continuously.

BALL MOUNTAIN LAKE
INSPECTION CHECKLIST

Inspectors:_____ Date_____ Time_____

_____

_____

_____

Pool Elevation_____

Item	Yes	No	Description	Insp. Init.
1. Dam				
A. Crest				
(1) Misalignment				
(2) Settlement				
(3) Heaving				
(4) Cracks				
B. Upstream Face				
(1) Misalignment				
(2) Cracks				
(3) Reservoir Surface Disturbance (eddy, vortex, etc.)				
C. Downstream Face				
(1) Misalignment				
(2) Cracks				
(3) Seepage*				
(a) Location				
(b) Quantity				
(c) Clear or Turbid				
(4) Additional Settlement				
(5) Further Movement of Bulge				

BALL MOUNTAIN LAKE
INSPECTION CHECKLIST

Item	Yes	No	Description	Insp. Init.
2. Control Tower, Conduit and Outlet Structure				
A. Control Tower				
(1) Misalignment				
(2) Settlement				
(3) Heaving				
(4) Joints				
(a) Offsets				
(b) Cracks				
(5) Cracks				
(6) Exposed Reinforcement				
B. Conduit and Outlet Structure				
(1) Misalignment				
(2) Joints				
(a) Offsets				
(b) Cracks				
(3) Cracks				
(4) Exposed Reinforcement				
3. Spillway				
A. Misalignment				
B. Cracks				
C. Exposed Reinforcement				

BALL MOUNTAIN LAKE
INSPECTION CHECKLIST

Item	Yes	No	Description	Insp. Init.
4. Service Bridge to Control Tower				
A. Misalignment				
B. Settlement				
C. Heaving				
D. Cracks				
E. Joints				
(1) Offsets				
(2) Cracks				
F. Exposed Reinforcement				
5. Instrumentation Monitoring				
A. Strong Motion Instruments				
(1) Activated				
B. Monitor and Record				
(1) Reservoir Level Recorder				
(2) Downstream Tailwater Gage				
(3) Dam Piezometers (not available at this time)				
(4) Crest Monumentation				

BALL MOUNTAIN LAKE
INSPECTION CHECKLIST

Item	Yes	No	Description	Insp. Init.
6. Downstream Left and Right Valley Slopes & Outlet Channel				
A. Slides				
B. Cracks				
C. Signs of Movement				
7. Dam Access Roads and Parking Areas				
A. Signs of Movement				
B. Cracks				
8. Reservoir Surveillance (signs of new sliding, fresh fallen trees, cracking, etc.) and Inlet Channel				
9. Electrical-Mechanical				
A. Service Gates (3) Operable				
B. Emergency Stop Logs Available				
C. Emergency Power Operable				

* Since it may take time for a seepage condition(s) to occur, visually inspect for seepage immediately after an earthquake. If no seepage or if no new or increased seepage (relative to condition(s) prior to earthquake) are detected, reinspect for seepage within 2-4 hours, 6-8 hours, 18-24 hours, and 48 hours after the earthquake unless otherwise instructed by Division. If a new or increased seepage condition(s) is detected during an inspection after the earthquake, monitor and record seepage hourly until instructed otherwise by Division.

DESCRIPTION OF CHARACTERISTIC EFFECTS FOR EARTHQUAKES

Instrumental	Detected only by seismography
Feeble	Noticed only by sensitive people
Slight	Like the vibrations due to a passing truck; felt by people at rest, especially on upper floors
Moderate	Felt by people while walking; rocking of loose objects, including standing vehicles
Rather Strong	Felt generally; most sleepers are wakened and bells ring
Strong	Trees sway and all suspended objects swing; damage by overturning and falling of loose objects
Very Strong	General alarm; walls crack; plaster falls
Destructive	Car drivers seriously disturbed; masonry fissured; chimneys fall; poorly constructed buildings damaged
Ruinous	Some house collapse where ground begins to crack, and pipes break open
Disastrous	Ground cracks badly; many buildings destroyed and railway lines bent; landslides on steep slopes
Very Disastrous	Few buildings remain standing; bridges destroyed; all services (railway, pipes and cables) out of action; great landslides and floods
Catastrophic	Total destruction; objects thrown into air; ground rises and falls in waves

6. EMERGENCY OPERATIONS AND REPAIR SUBPLAN

a. General - This subplan provides guidance for emergency operations and repairs to deal with impending and existing emergencies affecting the operation and safety of Ball Mountain Lake.

b. Responsibilities - The Ball Mountain Lake Project Manager is designated as the responsible Corps of Engineers staff member to report the nature and magnitude of a specific problem. Minor remedial repairs will be handled through normal operating procedures. However, should an emergency situation occur at the site, the Project Manager should furnish information for the Situation Report as described in the NOTIFICATION SUBPLAN of this report.

Where sufficient notification time exists, technical guidance will be furnished to the Project Manager by the predesignated Emergency Response Team for emergency repairs. The Team Leader and/or members will normally provide on-site guidance during the initial stages of repair work. An emergency condition such as the resulting effects from an earthquake might preclude this on-site presence by the Emergency Response Team due to other hazardous conditions that prevent travelling to the site. The Emergency Response Team Leader and/or members will be on site during the final inspection to insure that all work has been satisfactorily completed and remain in contact with the Project Manager through the follow-up monitoring stage.

When an emergency situation exists or is impending where sufficient notification time does not exist, Emergency Operations Center may direct a temporary emergency measure to be implemented by the Project Manager. As noted in the following Notification Subplan, when failure is in progress or is imminent, action will be taken by the Project Manager utilizing government resources at his disposal to try to save human life, prevent immediate human suffering, or mitigate major property damage or destruction.

Reservoir regulation changes due to emergency conditions will be directed to the Project Manager by the Reservoir Control Center.

c. Safety of Personnel and Equipment - Utmost care should be given to the safety of the personnel engaged in all remedial activities. When it is evident that failure is at hand and that the failure cannot be effectively delayed, all personnel will be ordered from the unsafe area at the discretion of the Emergency Response Team leader or the Project Manager if the Emergency Response Team has not arrived. Equipment should be moved to a

safe area, but only to the degree practical as safety to personnel and time allows.

d. Inventory of Equipment, Materials and Suppliers - In order that various emergency situations can be addressed, it is necessary to preplan resources, such as equipment and material that may be required. Plates 6-1a through 6-1c are a list indicating where the following resources are available:

-Equipment and Materials Available at the Site.
-Sources of Sand, Gravel, Stone and Concrete.
-Contractors and Equipment.
-Grouting Suppliers.
-Drilling Equipment Contractors and Suppliers.
-Crane Rentals.
-Military Construction Support.
-Aircraft Support.

e. Emergency Contract Authority - In an emergency situation, the Division Commander can activate emergency contracting authority for the following persons in the listed amounts (excluding architect-engineer work):

NAME	CAPACITY	AMOUNT
James E. Leonard	Resident Engineer Construction Division Office: (413) 593-6791, 6792, 6793 Home: (413) 739-9373	$100,000
Cornelius T. Morin	Chief, S&I Branch Construction Division Office: (617) 647-8478 Home: (603) 432-5529	$100,000
James C. Wong	Chief, Project Operations Branch, Operations Division Office: (617) 647-8478 Home: (617) 875-1555	$100,000

If additional equipment, contractual support, or supplies are needed, contract procedures and staff support shall be administered by the Division Procurement and Supply Office.

f. Dewatering - Releases by the Project Manager must be coordinated with the Reservoir Control Center. For Ball Mountain Lake, the maximum nondamaging channel capacity immediately downstream is about 5,000 cfs.

The rate of reservoir drawdown for an emergency condition depends on the urgency of the situation. When major structural damage has occurred to the embankment, such as piping or sloughing, the most effective action almost always involves lowering the pool. However, too rapid lowering of the reservoir may have adverse effects on the stability of the dam. Specified rates of drawdown must be observed unless embankment failure is occurring or imminent. A controlled release will relieve the pressure on the structure and minimize the downstream risk of possible loss of life.

The procedure for dewatering will consider the rate required and duration of the release. Depending upon the rate of release required, warning for downstream areas along the West River should be issued in accordance with the NOTIFICATION SUBPLAN. It is recognized that, for all but the most serious conditions, to judge "imminent failure" is determined by the best available data within a limited time frame. To assist in the decision for emergency drawdown, the following plates are provided:

Plate 6-2a Emergency Drawdown Curves
Plate 6-2b Area and Capacity Table
Plate 6-2c Percent Full Curve
Plate 6-2d Spillway Rating Curve
Plate 6-2e Outlet Rating Curves for One Gate
Plate 6-2f Curve for Determination of Reservoir Inflows
Plate 6-2g Outlet Rating Curves for Three Gates - Fully Open

Consideration to opening all gates and exceeding downstream channel capacity will be made by Reservoir Control Center in the event of an existing or imminent failure of the embankment.

g. Guide For Repair/Response to Distress - The Ball Mountain Lake project was designed and constructed to withstand possible conditions that it may be subject to in the future. It is unlikely that an emergency condition would develop resulting in distress which would seriously threaten the project and ultimately endanger life and/or property downstream. For the distress experienced at the project, excluding significant downstream releases, the Project Manager is to provide a SITUATION REPORT as described in the NOTIFICATION SUBPLAN. The degree of the distress and estimate of response time before catastrophe could occur dictates the type and quality of repair and/or temporary solution to be implemented.

Preferably, the technical assistance of the Emergency Response Team members or direction from Division staff should be utilized to address the specific distress. With the specific distress resulting from one of the possible events cited in the Emergency Identification Subplan, many variables would be

involved which would affect the nature of the repair or solution. The following paragraphs suggest emergency actions and/or treatments to be considered and supplement information in the matrix entitled "Signs of Distress" (Plates 5-2a through 5-2i) in the Emergency Identification Subplan. These are meant as a guide only.

(1) Ringing a Boil or Use of a Granular Blanket - Seepage on the face of the embankment, large amounts of seepage, and seepage carrying fines are especially serious signs of distress. Excess seepage problems are most likely to occur when the lake water level is at higher than normal elevations. Thus, a driving force for this unusual seepage is the head of water imposed by the reservoir. To alleviate the above, consideration should be given to implement the guide to dewatering as discussed in Section 6-f to decrease the head.

Individual boils or small areas of seepage can be controlled on a temporary basis by ringing them with sandbags or other materials. See Plate 6-3 for a schematic of ringing a boil. Technical directions for ringing boils are as follows:

-The entire base of the sack ring is cleared of debris, in order to provide a water-tight bond between the natural ground and the sack ring. Multiple nearby boils or soft areas in vicinity of the boil should be included within the sandbag ring.

-The base of the sandbag ring should be at least one and one-half times the contemplated height. The sacks are laid in a ring around the boil with joints staggered.

-The ring should be built only high enough to slow water flow to a point that no fines are carried. Do not shut flow of seepage completely off. The ring shall be of sufficient size to permit sacking operations to keep ahead of the flow of water.

-As shown on Plate 6-3, a low point of emergency spillway is provided on the top of ring to carry off the water.

Longer term control and control of large areas of seepage can be effected by covering the area with a deep granular blanket graded from coarse sands at the bottom to coarse gravels at the top.

(2) Overtopping - Although the spillway was designed to accommodate a Probable Maximum Flood, it is remotely possible for the discharge capacity to be exceeded under certain circumstances.

Despite the conservative efforts by designers to eliminate the danger of overtopping, certain unpredictable events, such as a landslide or earthquake, could cause enough disturbance in the reservoir for overtopping of the dam to occur. Since landslides have not been experienced in the project's life (i.e., placed in operation in 1961), occurrence of either event is remote. If the earthquake magnitude was high enough, a "large wave" could be created in the reservoir which could send water over the top of the dam. Also, a large landslide could displace enough water to raise the level of the reservoir in a short time frame by a wave.

However, Ball Mountain Lake was constructed with a dumped rock downstream face, which would make it somewhat resistant to erosion due to overtopping. Certainly a corrective action, if the gates are operable, is to increase releases and thus consult the dewatering plan. If erosion to the slope has occurred due to overtopping, consideration should be given to filling the areas with riprap, sandbags, or a granular blanket. The preferred method depends on materials and labor available and the urgency of action. When the situation permits, the Emergency Response Team will provide direction on the type of repair.

(3) Operator Absence or Disablement - As discussed in Section 3, should the Project Manager (Operator) be unavailable, then the Ball Mountain Lake Assistant Project Manager or the Project Manager and/or his assistant at Townshend Lake could substitute to operate the project. The Upper Connecticut River Basin Manager will designate the individual who will assume control of the project.

(4) Equipment Malfunction - Should commercial electric power become unavailable, the Project Manager would utilize the diesel engine-generator set in the gate house. If the emergency engine is inoperable, there is no manual operation of the gates and Emergency Response Team guidance is desired, depending on the urgency of the situation.

If gate cannot be lowered, installation of stop logs on the intake structure can be considered. However, because the stop logs are external to the gate house, it would be necessary to hire a portable crane to place them. This would only be practical when the pool elevation was below that of the intake structure.

(5) Sabotage - Sabotage threats are to be taken seriously. Should a threat occur, the staff member receiving the call should attempt to obtain information similar to that acquired for a BOMB THREAT (Plate 6-4). The information should be reported to Emergency Operations Center and the Division Chief of Security and Law Enforcement.

An actual act of sabotage may range from minor disruptions to quasi-military attacks by knowledgeable and well-equipped professionals. The effects of sabotage fall into one of three categories: a) not affecting safety of the dam; b) posing a minor or future safety problem; c) posing an immediate, serious safety problem. All threats or acts of sabotage will be reported immediately to Emergency Operations Center and the Division Chief of Security and Law Enforcement.

Depending on the severity of the sabotage act and the resulting urgency of action, remedial repair work could be directed by the Emergency Response Team or alternatively dependent on information provided in the SITUATION REPORT, the Project Manager may be directed to initiate some temporary remedial action.

INVENTORY OF EQUIPMENT, MATERIALS & SUPPLIERS

(1) Equipment and Materials Available at Ball Mountain Lake

5 ton dump truck (4x2)
John Deere Model 1250 tractor/loader
International Model H-60E front end loader (2 c.y.)
2,000 sand bags at Basin Manager's Office, North Springfield Lake

Crisafalli Pumps are also located at the following Corps of Engineers Projects:

1 - Tully Lake, Athol, MA
1 - Franklin Falls Dam, Franklin, N.H.
1 - Buffumville Lake Dam, Oxford, MA
2 - New England Division Headquarters, Waltham, MA

1-12 inch Crisafalli Pump - Pumping capacity is 5000 gal/min. at 10 foot head or 3750 gal/min. at 20 foot head. A power take-off is required from a farm tractor or similar equipment for operating the pump. The tractor must have a minimum of 50 PTO horsepower.

(2) Sources of Sand, Gravel, Stone, and Concrete

Sand, Gravel and Stone

Roy Coleman	Bondville, VT	(802) 297-1641
Cerosimo Lumber Co., Inc.	Brattleboro, VT	(802) 254-4508
Donald Gould & Sons, Inc.	Newfane, VT	(802) 365-7513
Brattleboro Sand & Gravel	Brattleboro, VT	(802) 254-5213

Concrete

Dailey Concrete	Manchester, VT	(802) 362-2556
H & R	Manchester, VT	(802) 362-3079
Brattleboro Sand & Gravel	Brattleboro, VT	(802) 254-5213
Summarsell Ready Mix	Hartland, VT	(802) 436-2533

Inventory of Equipment, Materials & Suppliers

(3) Contractors and Equipment

The following is a list of contractors who can supply heavy equipment including, but not limited to, bulldozers, backhoes, loaders, trucks, graders, trailers and scrapers:

Coleman & Sons	Bondville, VT	(802) 297-1641
Arthur Brooks	Jamaica, VT	(802) 874-7341
Clyde Prouty	S. Londonderry, VT	(802) 824-5215
Gurney Brothers	N. Springfield, VT	(802) 886-2210
Zaluzny Excavating	Brattleboro, VT	(802) 254-5758
Phil Jarvis Co.	Brattleboro, VT	(802) 254-6839
Lamb's Contractor Co.	Brattleboro, VT	(802) 257-4143

(4) Grouting Suppliers

New England Gunite, Inc.	W. Springfield, MA	(413) 733-5094
Monadnock Concrete Pumping	New Ipswich,. NH	(603) 878-3311
Morse Block, Inc.	Bennington, VT	(802) 442-2260
Eastern Granite Corp.	Waltham, MA	(617) 893-7422

(5) Drilling Equipment Contractors & Suppliers

Green Mt. Boring Co., Inc.	Barre, VT	(802) 476-5073
Explosive Engineering, Inc.	Grand Isle, VT	(802) 372-5376
Carl Thomas Construction	Spofford, NH	(603) 363-4410
Con-Tec, Inc.	Hooksett, NH	(603) 224-0020
Soils Engineering, Inc.	Charlestown, NH	(603) 826-5873
N.E. Boring Contractors	Springfield, MA	(413) 733-1232
Soil Exploration Corp.	Stow, MA	(617) 897-8737

(6) Crane Rentals

Miller Construction	Windsor, VT	(802) 674-5525
Burgess Bros., Inc.	Bennington, VT	(802) 442-4828

(7) Military Construction Support

Fort Devens, MA, 39th Engineer Battalion (Combat). This unit's military operations include building roads and bridges, installing mine fields, destroying enemy barriers, and fighting as an infantry.

Point of Contact

Post Commander, M.G. Robert F. Molinelli	(617) 796-2126/3923
Commander 39th Engr. Battalion Lt. Col. Philip H. Shoemaker	(617) 796-2080/2008

642nd Engineer Equipment Co. (CSE). This unit maintains and operates construction equipment and serves as a construction unit for installation.

Point of Contact

Post Commander, M.G. Robert F. Molinelli	(617) 796-2126/3923
Company Commander 642nd Captain William H. Poirier	(617) 796-3231/3117

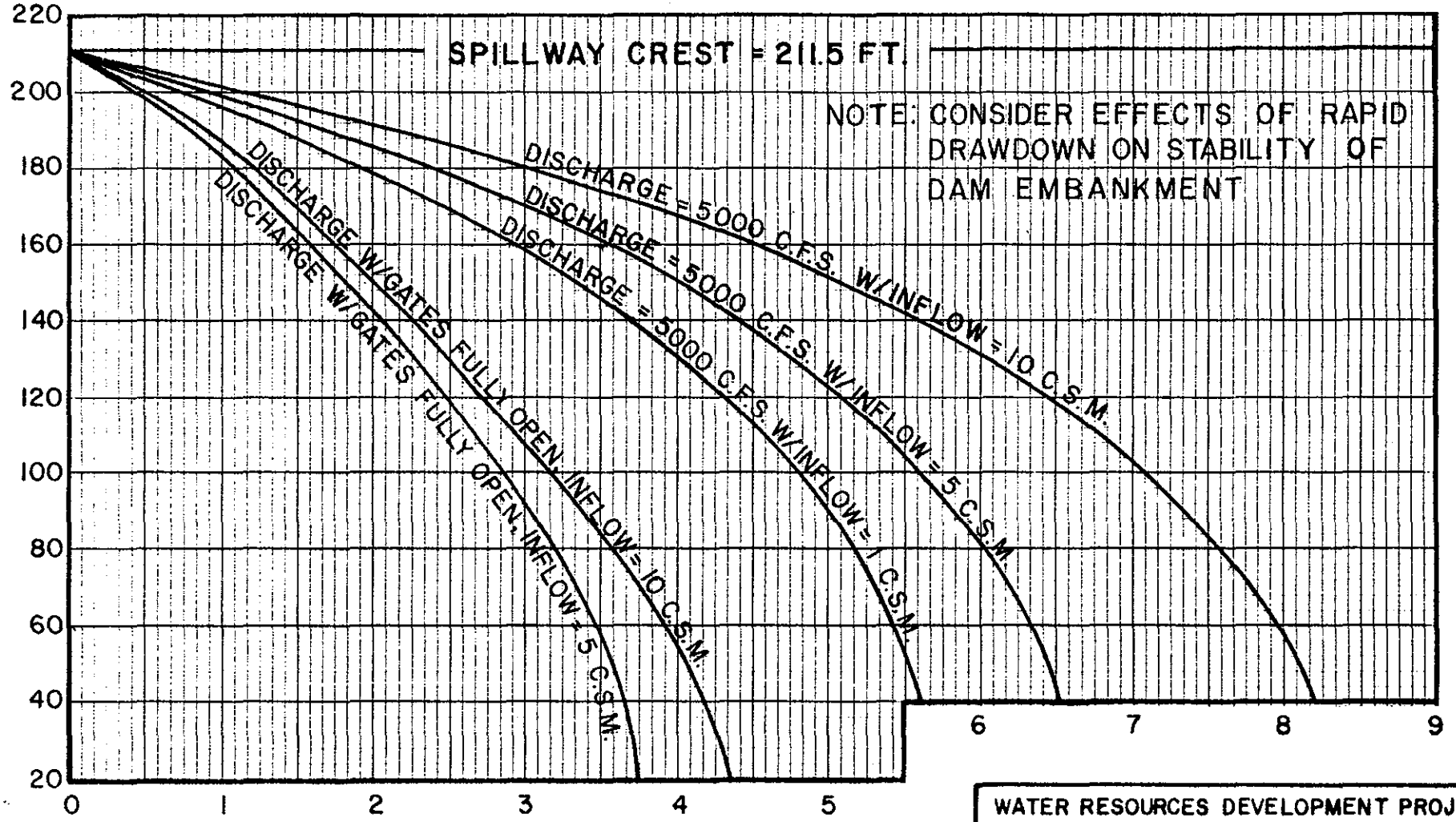
(8) Aircraft Support

Military

Contact Flight Operations Officer at Moore Army Airfield, Fort Devens at (617) 796-3261/3130. Utility (8-9 persons) or Observation Helicopters (2 persons) are located at airfield.

Private

Drewsville Airways	Drewsville, NH	(603) 445-5249
Cheshire Airways	Keene, NH	(603) 352-3951
Tri-State Helicopter	White River Junction, VT	(802) 295-7587
Skymaster	Plymouth, NH	(603) 536-3557
Precision Airlines	N. Clarendon, VT	(802) 773-2735
Vermont Flying Service	Montpelier, VT	(802) 223-2221



INVERT ELEV. = 805.5 RECREATION POOL = 870.5

WATER RESOURCES DEVELOPMENT PROJECT
CONNECTICUT RIVER BASIN
BALL MOUNTAIN LAKE
EMERGENCY DRAWDOWN CURVES
NEW ENGLAND DIVISION, WALTHAM MASS.
NOVEMBER 1964

PLATE 6-2a

BALL MOUNTAIN LAKE
AREA AND CAPACITY TABLE

D.A. = 172 s.m.

ELEV. MSL	STAGE FEET	AREA ACRES	CAPACITY AC. FT.	CAPACITY INCHES	REC. SEASON AC. FT.	REC. SEASON INCHES
805.5	0	0	(Gate Invert El. - 805.5)			
810.5	5	4	17	0.01		
815.5	10	8	48	0.01		
820.5	15	12	75	0.01		
825.5	20	16	155	0.02		
830.5	25	20	240	0.05		
		PERMANENT POOL - 830.5'				
835.5	30	27	130	0.01		
840.5	35	34	270	0.03		
845.5	40	41	460	0.05		
850.5	45	48	680	0.06		
855.5	50	55	950	0.10		
860.5	55	62	1250	0.14		
865.5	60	69	1610	0.18		
870.5	65	75	2000	0.22	0	0.00
		CONSERVATION POOL - 870.5'				
875.5	70	87	2470	0.27	470	0.05
880.5	75	100	2960	0.32	960	0.10
885.5	80	112	3530	0.38	1530	0.16
890.5	85	125	4130	0.45	2130	0.23
895.5	90	138	4840	0.52	2840	0.30
900.5	95	151	5570	0.61	3570	0.39
905.5	100	165	6400	0.70	4400	0.48
910.5	105	182	7260	0.79	5260	0.57
915.5	110	200	8250	0.90	6240	0.68
920.5	115	217	9260	1.01	7260	0.79
925.5	120	235	10460	1.14	8460	0.92
930.5	125	256	11690	1.27	9690	1.05
935.5	130	277	13080	1.42	11080	1.20
940.5	135	298	14560	1.58	12560	1.36
945.5	140	320	16060	1.75	14060	1.53
950.5	145	347	17710	1.92	15710	1.70
955.5	150	375	19460	2.07	17460	1.85
960.5	155	402	21360	2.32	19360	2.10
965.5	160	430	23360	2.54	21360	2.32
970.5	165	461	25510	2.78	23510	2.56
975.5	170	492	27860	3.03	25860	2.81
980.5	175	524	30260	3.29	28260	3.07
985.5	180	555	32960	3.58	30960	3.36
990.5	185	594	35760	3.89	33760	3.67
995.5	190	633	38860	4.22	36860	4.00
1000.5	195	672	42060	4.58	40060	4.36
1005.5	200	710	45660	4.96	43660	4.74
1010.5	205	755	49310	5.36	47310	5.14
1015.5	210	800	53260	5.80	51260	5.58
1017.0	211.5	810	54450	5.92	52450	5.70
		SPILLWAY CREST - 1017.0'				
1020.5	215	840	57260	6.23	55260	6.02
1025.5	220	890	61260	6.66	59260	6.45

PLATE 6-2b

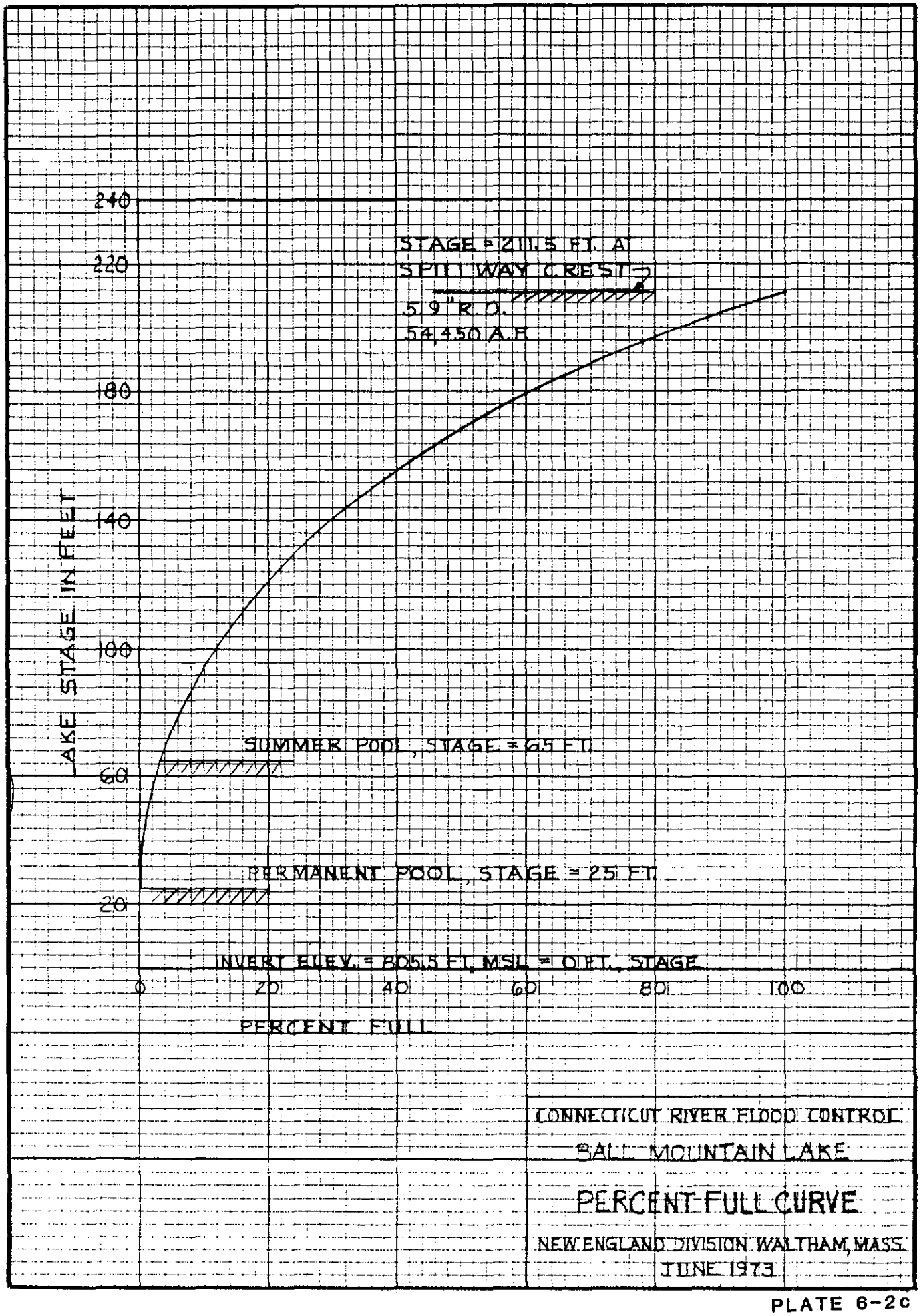

240
220
180
140
100
60
20
LAKE STAGE IN FEET
STAGE = 211.5 FT. AT
SPILLWAY CREST
5.9" R.O.
54,450 A.F.
SUMMER POOL, STAGE = 65 FT.
PERMANENT POOL, STAGE = 25 FT.
INVERT ELEV. = 805.5 FT. MSL = 0 FT., STAGE
0
20
40
60
80
100
PERCENT FULL
CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN LAKE
PERCENT FULL CURVE
NEW ENGLAND DIVISION WALTHAM, MASS.
JUNE 1973

PLATE 6-2c

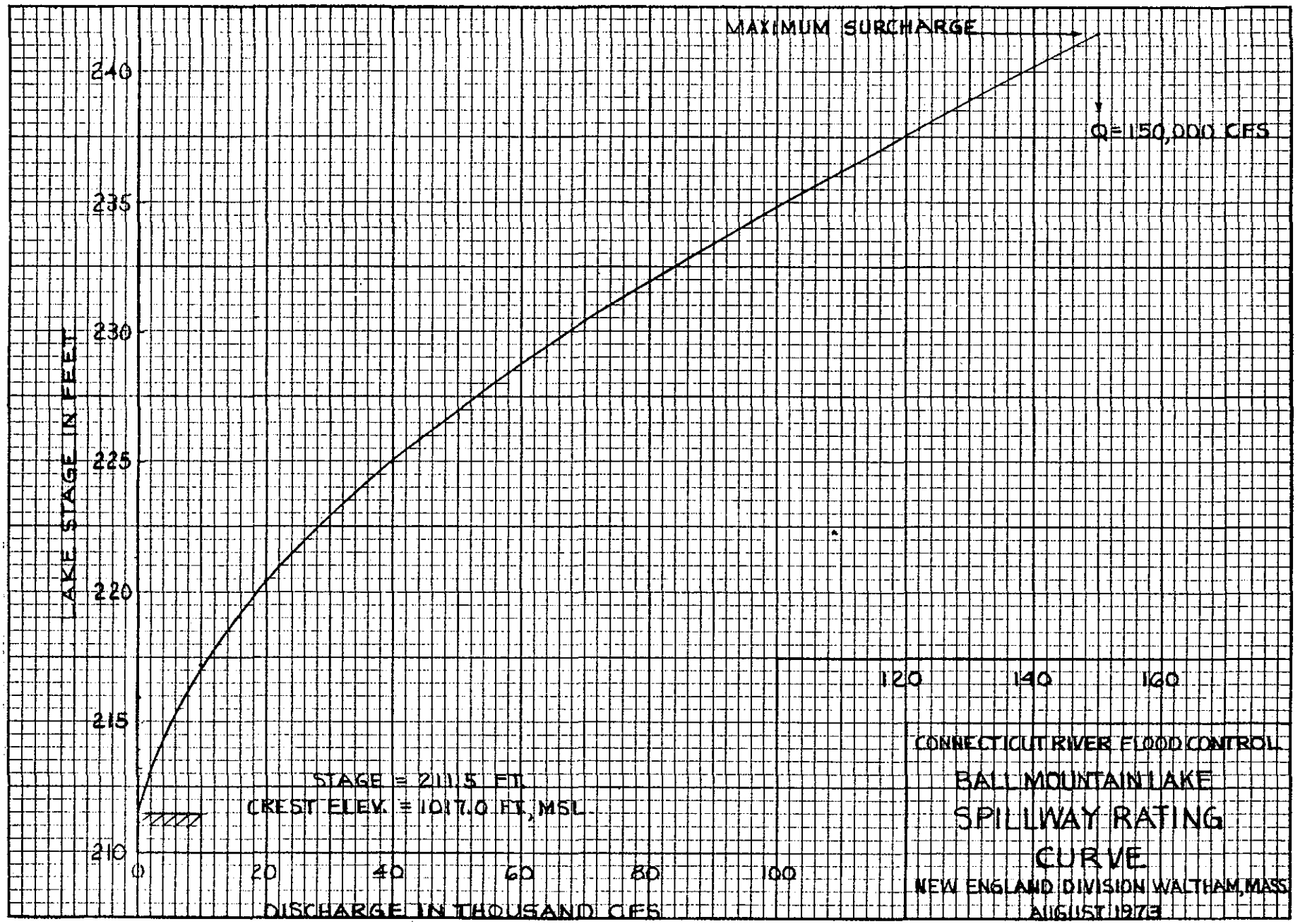

MAXIMUM SURCHARGE
Q=150,000 CFS
LAKE STAGE IN FEET
240
235
230
225
220
215
210
0
20
40
60
80
100
120
140
160
STAGE = 2111.5 FT.
CREST ELEV. = 1017.0 FT. MSL.
DISCHARGE IN THOUSAND CFS
CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN LAKE
SPILLWAY RATING
CURVE
NEW ENGLAND DIVISION WALTHAM, MASS.
AUGUST 1973

PLATE 6-2d

SPILLWAY CREST EL. 1011.0 FT. MSL. (STAGE = 211.5 FT.)

LAKE STAGE IN FEET

220
200
180
160
140
120
100
80
60
40
20
0

1 FOOT GATE OPENING
2 FOOT
3 FOOT
4 FOOT
5 FOOT
6 FOOT
7 FOOT
8 FOOT
9 FOOT
10 FOOT

LAKE ELEVATION IN FEET ABOVE MEAN SEA LEVEL

1005.5
985.5
965.5
945.5
925.5
905.5
885.5
865.5
845.5
825.5

INVERT ELEV. = 805.5 FT., M.S.L.

0 500 1000 1500 2000 2500 3000 3500 4000 4500

DISCHARGE IN CFS

THREE 5'-8" x 10'-0" GATES
15'-6" DIA. CONDUIT

CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN LAKE
OUTLET RATING CURVES
FOR ONE GATE
NEW ENGLAND DIVISION WALTHAM, MASS.
JUNE 1973

PLATE 6-2e

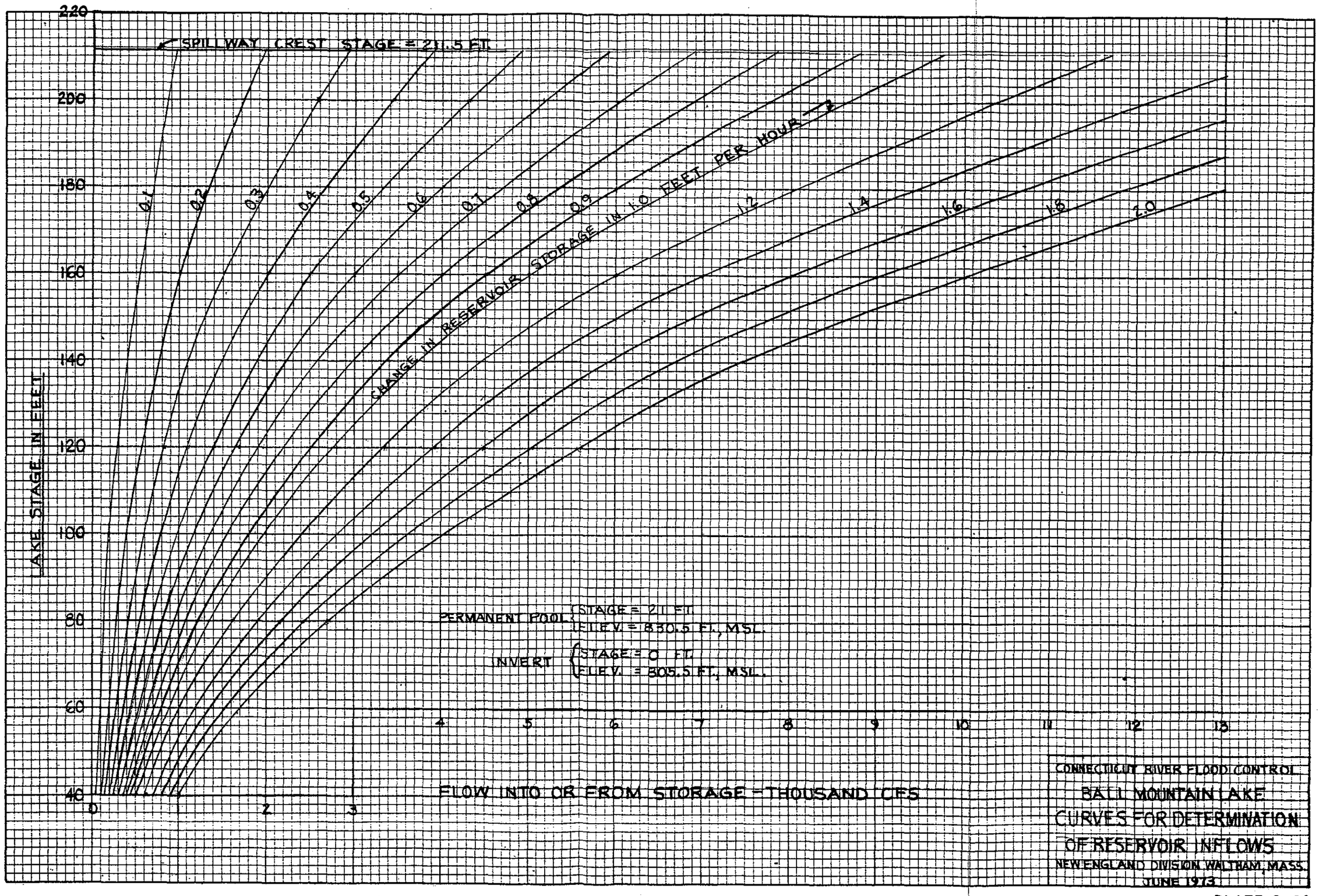

SPILLWAY CREST STAGE = 21.5 FT.
CHANGE IN RESERVOIR STORAGE IN 1.0 FEET PER HOUR
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.2
1.4
1.6
1.8
2.0
LAKE STAGE IN FEET
220
200
180
160
140
120
100
80
60
40
PERMANENT POOL {STAGE = 21 FT. ELEV. = 830.5 FT., MSL.
INVERT {STAGE = 0 FT. ELEV. = 809.5 FT., MSL.
0
2
3
4
5
6
7
8
9
10
11
12
13
FLOW INTO OR FROM STORAGE - THOUSAND CFS
CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN LAKE
CURVES FOR DETERMINATION
OF RESERVOIR INFLOWS
NEW ENGLAND DIVISION WALTHAM, MASS.
JUNE 1973

PLATE 6-2f

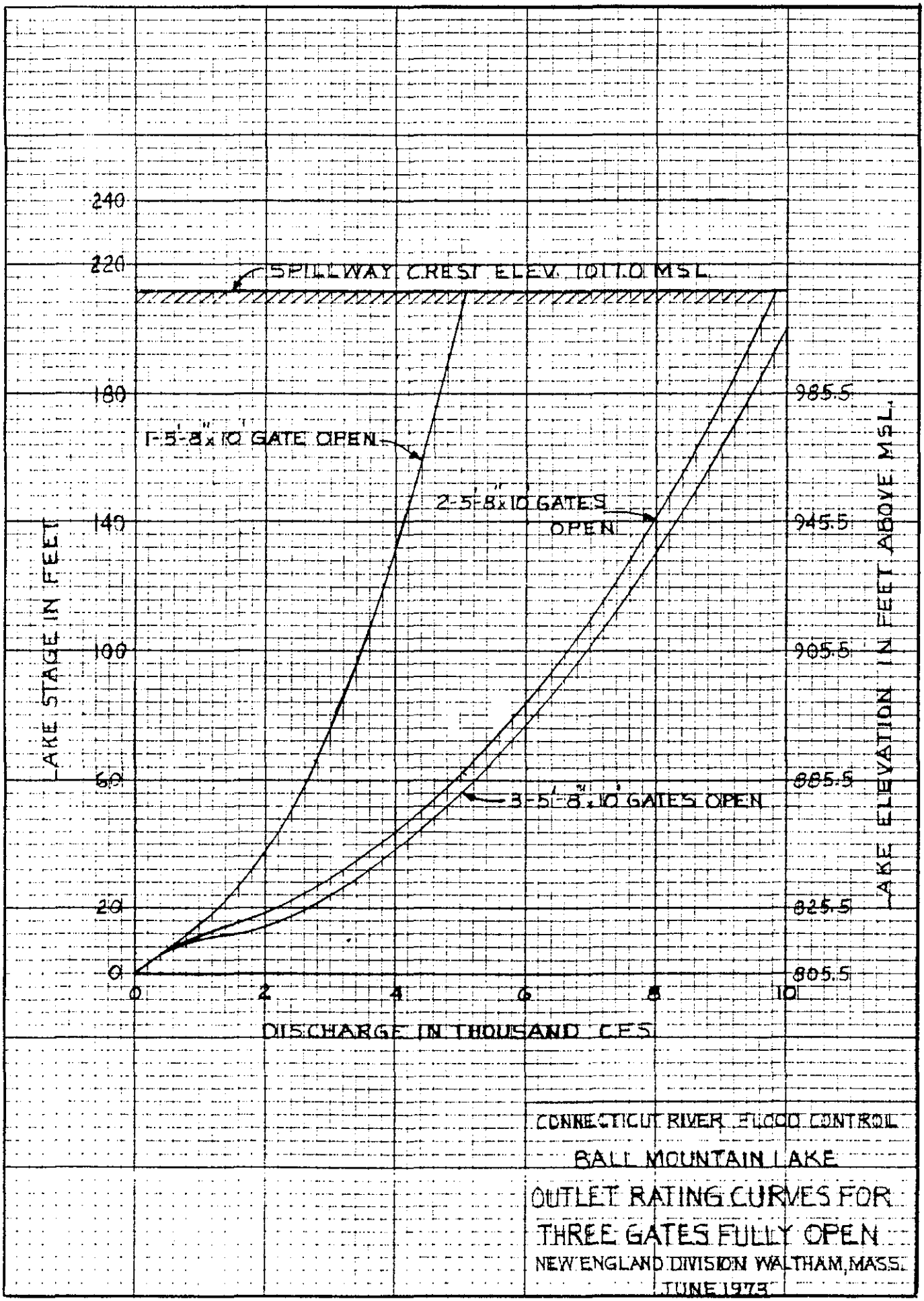
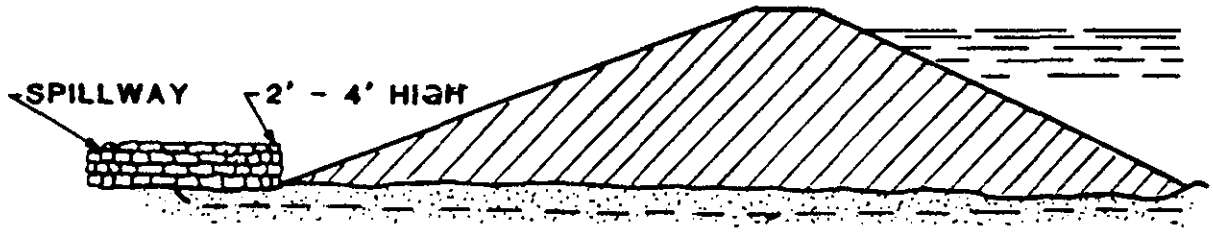
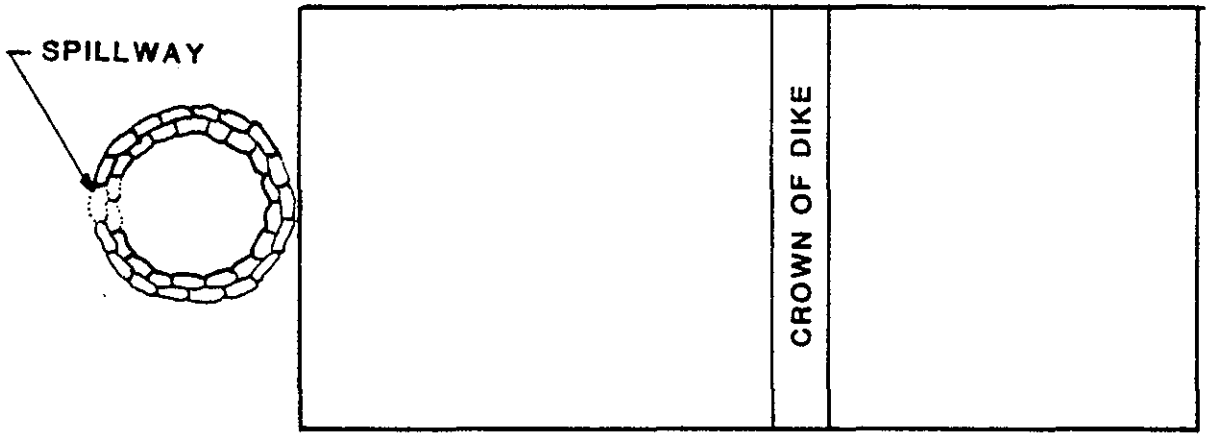

240
220
180
140
100
60
20
0
SPILLWAY CREST ELEV. 1011.0 MSL
1-5'-8"x10' GATE OPEN
2-5'-8"x10' GATES OPEN
3-5'-8"x10' GATES OPEN
LAKE STAGE IN FEET
985.5
945.5
905.5
885.5
825.5
805.5
LAKE ELEVATION IN FEET ABOVE MSL.
0
2
4
6
8
10
DISCHARGE IN THOUSAND C.F.S.
CONNECTICUT RIVER FLOOD CONTROL
BALL MOUNTAIN LAKE
OUTLET RATING CURVES FOR
THREE GATES FULLY OPEN
NEW ENGLAND DIVISION WALTHAM, MASS.
JUNE 1973

PLATE 6-2g



ELEVATION

WALL SHOULD BE BUILT ON FIRM FOUNDATION, WITH WIDTH OF BASE AT LEAST 11/2 TIMES THE HEIGHT. BE SURE TO PLACE SACKS ON GROUND CLEAR OF SAND DISCHARGE. TIE INTO DIKE IF BOIL IS NEAR TOE.



PLAN

DO NOT SACK BOIL WHICH DOES NOT PUT OUT MATERIAL. HEIGHT OF SACK LOOP OR RING SHOULD BE ONLY SUFFICIENT TO CREATE ENOUGH HEAD TO SLOW DOWN FLOW THROUGH BOIL SO THAT NO MORE MATERIAL IS DISPLACED AND BOIL RUNS CLEAR. DO NOT TRY TO STOP FULLY, FLOW THROUGH BOIL.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MA.

FLOOD EMERGENCY PLAN

6-136 (Rev. 7-27-77)

FBI BOMB DATA CENTER

PLACE THIS CARD UNDER YOUR TELEPHONE

QUESTIONS TO ASK:

1. When is bomb going to explode?
2. Where is it right now?
3. What does it look like?
4. What kind of bomb is it?
5. What will cause it to explode?
6. Did you place the bomb?
7. Why?
8. What is your address?
9. What is your name?

EXACT WORDING OF THE THREAT:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Sex of caller: _____ Race: _____

Age: _____ Length of call: _____

Number at which call is received:

_____

Time: _____ Date: __/__/__ FBI/OOJ

BOMB THREAT

CALLER'S VOICE:

____ Calm	____ Nasal
____ Angry	____ Stutter
____ Excited	____ Lisp
____ Slow	____ Raspy
____ Rapid	____ Deep
____ Soft	____ Ragged
____ Loud	____ Clearing throat
____ Laughter	____ Deep breathing
____ Crying	____ Cracking voice
____ Normal	____ Disguised
____ Distinct	____ Accent
____ Slurred	____ Familiar
____ Whispered	

If voice is familiar, who did it sound like?

_____

_____

BACKGROUND SOUNDS:

____ Street noises	____ Factory machinery
____ Crockery	____ Animal noises
____ Voices	____ Clear
____ PA System	____ Static
____ Music	____ Local
____ House noises	____ Long distance
____ Motor	____ Booth
____ Office machinery	Other _____

THREAT LANGUAGE:

____ Well spoken (educated)	____ Incoherent
____ Foul	____ Taped
____ Irrational	____ Message read by threat maker

REMARKS: _____

_____

_____

_____

Report call immediately to:

_____

Phone number _____

Date __/__/__

Name _____

Position _____

Phone number _____

DO NOT DISCUSS CLASSIFIED INFORMATION ON THE TELEPHONE

PLATE 6-4

7. NOTIFICATION SUBPLAN

a. General - The objective of this subplan is to describe the procedures and means for prompt notification of parties concerning an existing or potential emergency at the project. Prompt notification is essential for minimizing hazards to life and property.

Notification will consist of but not be limited to the following:

(a) Internal Corps of Engineers notification.
(b) State and local officials and other federal agencies.
(c) Downstream officials.
(d) Media.

To assure timely notification, it is mandatory to minimize its complexity in order to assure prompt action. Thus, three notification subplans (Plates 7-1, 7-2, 7-3) are selected to cover a wide range of eventualities which could cause the possible emergency. These three emergency situations are: (1) rapidly developing condition, (2) significant reservoir releases and/or impoundment above spillway crest, and (3) dam failure in progress.

b. Rapidly Developing Condition - This situation is one in which the dam has not failed, but the project has experienced an emergency condition such as, but not limited to, the following: sabotage, earthquake, landslide, foundation or abutment failure, slope failure or equipment failure.

The method of notification, as depicted on Plate 7-1, is dependent upon whether the situation report by the on-site Project Manager allows sufficient notification time before there is a hazard to life or significant property damage downstream. The Emergency Operations Center reviews the data in the Situation Report and decides whether to notify (1) internal Corps elements, or (2) State Civil Preparedness and local officials. The Project Manager is defined as the on-site Corps staff member responsible for operation and maintenance of the project. In order for Emergency Operations Center to assess the intensity and magnitude of the emergency, the PROJECT MANAGER will expeditiously furnish information in the SITUATION REPORT to Emergency Operations Center. If Emergency Operations Center cannot be readily contacted, the PROJECT MANAGER will contact the CHIEF, PROJECT OPERATIONS BRANCH. Plate 7-4 suggests information to be furnished in the Situation Report. Use of photographs is encouraged. A more detailed assessment of the emergency

condition will be normally made by the Emergency Response Team completing the Inspection Checklist (Plates 5-3a through 5-3d).

The time available for action is one of the most critical elements to be considered and will generally govern the procedural notification scheme selected by Emergency Operations Center in accordance with Plate 7-1.

(1) Rapidly Developing Condition (Sufficient Notification Time) -

A rapidly developing condition with sufficient notification time is one in which the occurrence of a significant hazard to life and/or property is possible unless timely repairs and/or modifications to operational procedures can be conducted to prevent dam failure. Based on the situation report furnished by the Project Manager, sufficient notification time exists such that Emergency Operations Center can contact the Emergency Response Team Leader. The Emergency Response Team is a predesignated interdisciplinary team responsible for assessing the emergency situation and recommending the next course of action. The Emergency Response Team Leader will mobilize those team members needed and expeditiously proceed either to the project site or the Division Office. The selected initial point of destination will be decided by the Team Leader by considering the safety of the team in traveling and the specific emergency condition being experienced at the project site. The designated team member and alternates with their respective office and home phone numbers are found on Plates 7-5a and 7-5b.

The procedural notification chain illustrated on Plate 7-1 indicates the Emergency Operations Center will also contact: (a) Chief, Project Operations Branch, (b) the Division Engineer, (c) Chief, Engineering Division, (d) Chief, Construction Division, and (e) the Public Affairs Officer. Since timely notification is of the essence, Emergency Operations Center will proceed to contact the next party to be notified in the chain, should a designated contact point not be readily reached. The Division Notification List, consisting of the Emergency Response Team and the Division Personnel, is found on Plates 7-5a, 7-5b, 7-6a and 7-6b. The Office of the Chief of Engineers Notification List is listed on Plate 7-8. The selected notification chain is designed for the adverse circumstances which could prevail in the middle of the night or on a weekend.

The Chief, Engineering Division, is the designated <u>DAM SAFETY OFFICER</u>.

(2) Rapidly Developing Condition (Insufficient Notification Time) -

Based upon the Project Manager's situation report, the time available to correct the emergency is very limited under this condition. Thus, the potential threat to downstream residents and/or property damage is heightened. Emergency Operations Center decides that with this limited notification time, the situation warrants that the State Civil Preparedness be contacted directly. Following notification of the State Civil Preparedness as indicated on Plate 7-1, internal Corps notification is initiated. Telephone numbers for non-Corps points of contact are listed on Plate 7-7.

c. Large Reservoir Releases and/or Reservoir Impoundment- The Reservoir Control Center is designated as the element responsible for the initiation and coordination of this subplan. This plan applies to either impoundments above spillway crest (Elevation 1017.0 feet) which would result in uncontrolled releases or controlled releases by gates that exceed downstream channel capacity. Reservoir regulation procedures are described in Appendix D of the Connecticut River Basin Master Manual of Water Control. For either situation depicted in Plate 7-2 considerable judgment and experience would be used to vary the regulation in accordance with the amount of residual reservoir storage at Ball Mountain Lake, river stages, anticipated runoff in the watershed and weather forecasts.

During a major flood, the gates will not ordinarily be opened to avoid spillway discharge. Surcharge storage above the spillway crest will be utilized if the downstream channel capacity continues to be exceeded by runoff from uncontrolled areas. If the stored floodwaters in Ball Mountain Lake continue to rise above the spillway crest with the possibility of the pool exceeding the maximum design surcharge, the gates will be gradually opened. The gates will be fully open when the pool has reached about two-thirds design surcharge. See table below.

Pool Elevation (ft. NGVD)	Pool Stage (ft.)	Operation Required
1032	226.5 (15 ft. above spillway crest)	3 gates 3 ft. open
1037	231.5 (20 ft. above spillway crest)	3 gates 6 ft. open
1042	236.5 (25 ft. above spillway crest)	3 gates fully open

For reservoir impoundments expected to exceed spillway crest (Elevation 1017.0 feet), Reservoir Control Center will contact

Emergency Operations Center (Plate 7-2) and subsequent State and local officials will be notified by Emergency Operations Center. Alternatively, if sufficient time does not exist, the Project Manager at the direction of the Reservoir Control Center may contact directly the appropriate officials (i.e., Police Chiefs of Londonderry and Jamaica and the State Police at the Brattleboro barracks. See Plate 7-7).

Similarly, for conduit releases that exceed downstream channel capacity, Reservoir Control Center will contact Emergency Operations Center. In turn, Emergency Operations Center will contact the State Civil Preparedness and the local police chiefs. If sufficient notification time is not available, the Project Manager at the direction of Reservoir Control Center will contact directly the Police Chiefs in the downstream communities of Jamaica, East Jamaica, West Townshend, Townshend, Harmonyville and West Dummerston, and the State Police at the Brattleboro barracks (Plate 7-7).

d. Dam Failure in Progress - When dam failure is in progress or imminently about to occur, action will be taken by the Project Manager utilizing government resources at his disposal to save human life, prevent immediate human suffering, or mitigate major property damage or destruction.

When failure has occurred or is imminent, the Project Manager's first action should be to notify the Emergency Operations Center, who in turn will notify the local officials (Plate 7-3). As depicted on Plates 7-12a through 7-12d, the blue shaded areas indicate areas which could be inundated, assuming a hypothetical dam break at Ball Mountain Lake with pool full to spillway crest. Since a dam break and the ensuing events are a highly unpredictable happening to precisely quantify, the plates are presented to provide information for emergency planning of potential areas to be evacuated. The map reflects conditions of an extreme nature with a very small probability of occurring and does not reflect in any way upon the integrity of the dam.

For details on the development of the dam-break analysis, which quantified the flood potential based on certain assumptions, see "Ball Mountain Lake-Dam Break Flood Analysis", dated September 1981. Full size mylar drawings (30"x42") of the inundation mapping area are located at the New England Division, Corps of Engineers (Engineering Division-Water Control Branch, Building 115N).

e. Notification of the Corps Office of the Chief of Engineers (OCE) - In accordance with ER 1110-2-101, "Reporting of Evidence of Distress of Civil Works Projects", dated 31 January 1984, the Chief of Engineering Division will immediately report conditions

to the Office of Chief of Engineers, whereby an engineering evaluation of the evidence of distress indicates the need for immediate remedial action or the potential of failure. The Chief of Engineering Division will report such conditions through command channels to the HQUSACE Dam Safety Officer. If the Dam Safety Officer cannot be contacted, the Division will follow the notification sequence as outlined on Plate 7-8.

f. Inquiries and Press Releases - Division personnel should refer all inquiries from the news media and general public regarding an "emergency condition" to the Division Public Affairs Office, (617) 647-8778. The Division Public Affairs Office will be responsible for responding to these inquiries. Examples of press releases for both emergency conditions are presented in Plates 7-9a and 7-9b for information only. A notification list of radio and television stations serving the communities in the vicinity of Ball Mountain Lake is also included in Plate 7-10 for notification by the Public Affairs Office.

NOTIFICATION SUBPLAN

DAM FAILURE IN PROGRESS

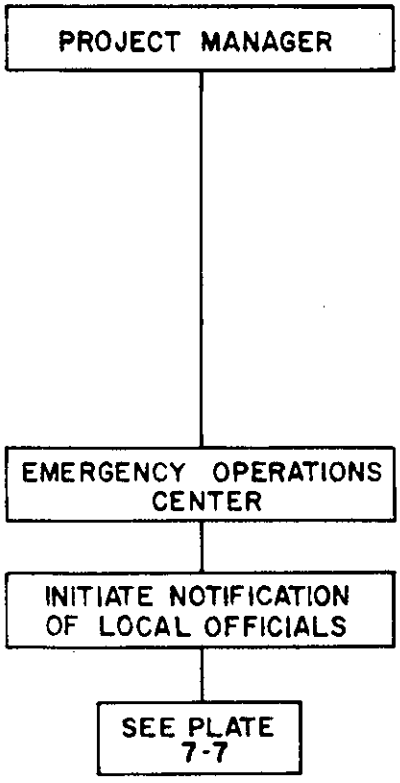


PLATE 7-1

NOTIFICATION SUBPLAN

RAPIDLY DEVELOPING CONDITION

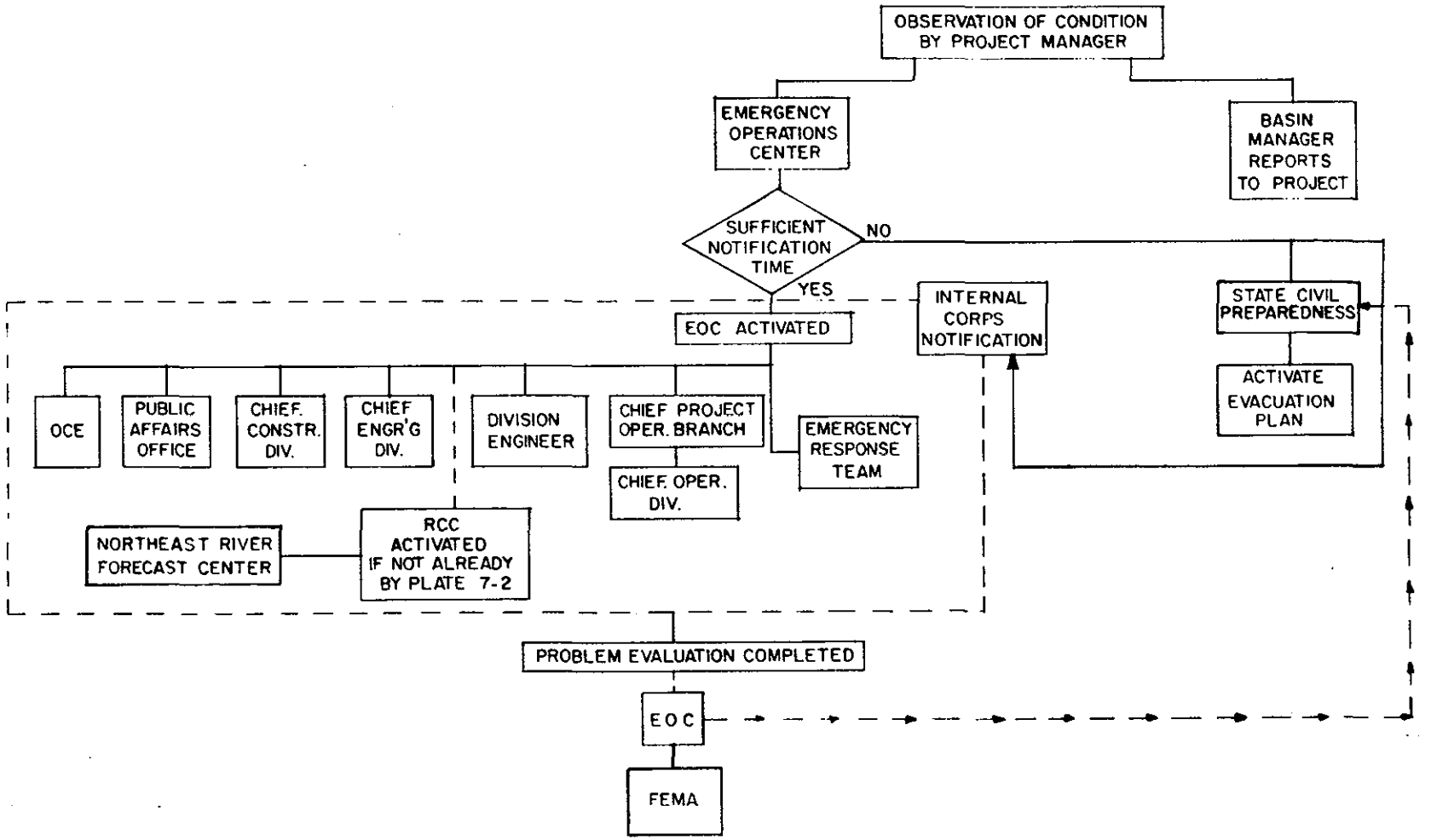


PLATE 7-2

NOTIFICATION SUBPLAN

ANTICIPATED LARGE RESERVOIR RELEASES AND/OR RESERVOIR IMPOUNDMENT ABOVE SPWY CREST (EL. 1017.0)

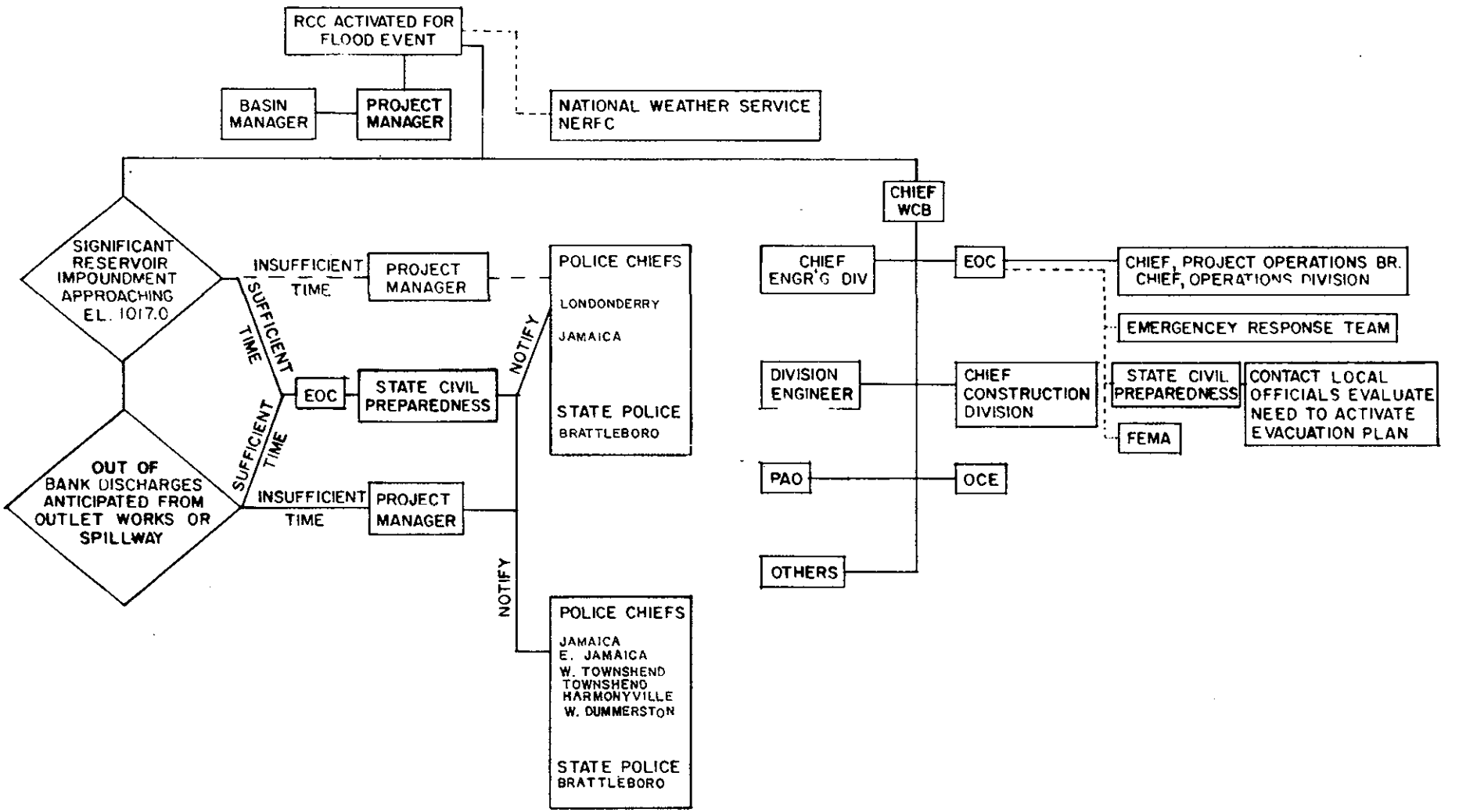


PLATE 7-3

GUIDELINE FOR SITUATION REPORT

1. Project Location:

2. Name and Position:

3. Telephone Where You Can Be Reached:

4. Alternate Source of Communication:

5. Nature and Severity of Problem - Use Photographs

   a. Physical Dimensions (e.g., current dimensions, rate of flow, etc.)

   b. Time and Progression of Problem

   c. Probable Cause

   d. Current and Predicted Reservoir Condition

6. Remedial Action: (if applicable)

   a. Type of Corrective Action Initiated

   b. Possible and Proposed Action (noting available sources, equipment, etc.)

7. Staff at Dam Site:

8. Are Authorities or Private Citizens Aware of Problem?

DIVISION NOTIFICATION LIST/EMERGENCY RESPONSE TEAM

Based upon the information provided in the Situation Report, Emergency Operations Center will decide whether to activate the Emergency Response Team to proceed to the project. Emergency Operations Center will contact the designated Team Leader or alternate listed below in order to activate the team. The Team Leader will be responsible for notifying the other team members or alternates inasmuch as the urgency of the "emergency condition" permits.

Geotechnical Representative, Team Leader - J. Hart	Office: Home:	617-647-8597 617-877-2870
Alternate Geotechnical Representative Team Leader - J. Blair	Office: Home:	617-647-8396 617-928-4062
Hydrology/Hydraulics Representative - P. Marinelli	Office: Home:	617-647-8541 617-481-4552
Alternate Hydrology/Hydraulics Representative - M. Geib	Office: Home:	617-647-8161 617-329-7758
Structural Representative - William Holtham	Office: Home:	617-647-8204 603-893-9438
Alternate Structural Representative - David Descoteaux	Office: Home:	617-647-8204 617-342-0787
Construction Representative - C. Morin	Office: Home:	617-647-8262 603-432-5529
Alternate Construction Representative - M. Beaudoin	Office: Home:	617-647-8263 617-823-5422
Mechanical-Electrical Representative - L. Young	Office: Home:	617-647-8466 617-472-4176
Alternate Mechanical-Electrical Representative - George Danek	Office: Home:	617-647-8489 617-275-2317
POB Representative - Michael Minior	Office: Home:	617-647-8331 617-487-1328
Alternate POB Representative - James Morocco	Office: Home:	617-647-8291 617-799-2336

Division Notification List/Emergency Response Team

Optional - Photographic Specialist - Anne Wright	Office: Home:	617-647-7488 617-628-5251
EOC Representative - J. Caffrey	Office: Home:	617-647-8270 617-391-2836
Alternate EOC Representative - T. Rosato	Office: Home:	617-647-8272 617-668-5130
Chief, Security & Law Enforcement - Lt. Col. James F. Westerkamp	Office: Home:	617-647-8226 617-772-4070

CONTRACT EOC FOR A SUBSTITUTION
OR ERT MEMBER, DIVISION PERSONNEL
AND/OR PHONE NO.

DIVISION NOTIFICATION LIST/DIVISION PERSONNEL

BALL MOUNTAIN LAKE

	Office	Home
Commander Colonel Carl B. Sciple	617-647-8220	617-772-0110
Deputy Commander Lt.Col. Edward D. Hammond	617-647-8222	617-944-6698
Chief, Operations Division Mr. Vyto Andreliunas	617-647-8320	617-692-7896
Chief, Project Operations Branch Mr. James Wong	617-647-8478	617-875-1555
Chief, Engineering Division Mr. Richard Reardon	617-647-8500	617-533-6271
Assistant Chief, Engineering Division Mr. Malcolm Girens	617-647-8722	
Chief, Construction Division Mr. Richard Carlson	617-647-8260	617-238-4191
Assistant Chief, Construction Division Mr. Peter Huie	617-647-8265	617-632-7539
Chief, Public Affairs Office Mr. Warren Nordman	617-647-8778	617-434-2397
Chief, Water Control Branch Mr. Lawrence Bergen	617-647-8627	617-376-5584
Chief, Reservoir Control Center Mr. Joseph Finegan	617-647-8630	617-535-0586
Chief, Emergency Operations Center (EOC) Mr. John Caffrey	617-647-8270	617-391-2836
Natural Disaster Manager Mr. Thomas Rosato	617-647-8272	617-668-5130

DIVISION NOTIFICATION LIST/DIVISION PERSONNEL

BALL MOUNTAIN LAKE

Chief Procurement & Supply Division	617-647-8415	
Security Police for Waltham Federal Center	617-647-8430	
Basin Manager Mr. Michael Curran	802-886-8111	802-885-4939
Dam Project Manager Mr. Ralph Snow	802-874-4881	802-874-4637
Assistant Project Manager Mr. Timothy Flynn	802-874-4881	802-365-7986

BALL MOUNTAIN LAKE

NOTIFICATION LIST FOR LOCAL AND STATE OFFICIALS AND OTHER FEDERAL AGENCIES

Local Officials

Londonderry	
Police Department	(802) 824-3915
Town Clerk	(802) 824-3356
Jamaica (includes East Jamaica)	
Police Department	(802) 254-2950
Board of Selectmen	(802) 874-4852
Townshend (includes Harmonyville, Newfane & West Dummerston)	
Police Department	(802) 254-2382
Townshend Selectman	(802) 365-4345
Brattleboro	
Police Department	(802) 254-2382
Public Works Department	(802) 254-4255
Windham County Sheriff Department	(802) 254-2950

State

State Police - Brattleboro Barracks	(802) 254-2382
Civil Preparedness - Waterbury, VT	(802) 244-8721
Dam Safety Official - Montpelier, VT	(802) 828-2761

Federal

Northeast River Forecast Center - Bloomfield, CT	(203) 722-2014 (203) 722-2178
FEMA	
Region I - Boston	(617) 223-1839 (617) 223-1840 (617) 223-1841

HQUSACE CIVIL WORKS PROJECT

DISTRESS NOTIFICATION LIST

Lloyd A. Duscha	HQUSACE Dam Safety Officer and Chairman of Dam Safety Committee DAEN-ECZ-B Office: 202-272-0382 Home: 703-860-1319
William N. McCormick	Chief of Engineering Division DAEN-ECE Office: 202-272-0397 Home: 703-569-4323
Jack R. Thompson	Assistant Chief of Engineering Division DAEN-ECE Office: 202-272-0215 Home: 703-978-5627
*Edward C. Prichett	Chief Geotechnical Branch DAEN-ECE-G Office: 202-272-0207 Home: 301-865-5876
*Cecil G. Goad	Chief Operations and Readiness Division DAEN-CWO Office: 202-272-0196 Home: 703-573-2704
*Vernon C. Hagen	Chief Hydraulics and Hydrology Division DAEN-CWH Office: 202-272-0228 Home: 703-451-1021

* Members of HQUSACE Dam Safety Committee

Note:

For notification, the Corps, NED, Dam Safety Officer or his designee will contact the HQUSACE Dam Safety Officer who will notify the Director of Engineering and Construction, the Director of Civil Works and the Chief of Engineers. In the event that the reporting field office is unable to contact the HQUSACE Dam Safety Officer, the field officer will continue down the list until a contact is made with HQUSACE. The HQUSACE contact will then be responsible for notifying the Directors and the Chief of Engineers.

NEWS RELEASE FOR RAPIDLY DEVELOPING CONDITION

BALL MOUNTAIN LAKE

_____ has been detected at the dam at Ball
(Problem)
Mountain Lake by the U.S. Army Corps of Engineers, New England Division.

A team of engineers from the Corps' New England Division will be investigating the _____ and
(Problem)
evaluating corrective measures to be taken.

The team will continue to monitor the situation and will be keeping officials in downstream communities apprised of developments. Evacuation plans would be implemented only if there was a likelihood for serious downstream damage from a failure of the dam.

Based on available data concerning the _____
(Problem)
the situation is _____.

Further information will be made available as developments occur.

PLATE 7-9a

NEWS RELEASE FOR

SIGNIFICANT RESERVOIR RELEASES AND/OR IMPOUNDMENT ABOVE SPILLWAY CREST

Flooding along the West River is occurring as a result of uncontrolled releases from the dam at Ball Mountain Lake according to the U.S. Army Corps of Engineers, New England Division. These releases are caused by

_____.

--OR--

Due to _____, flooding is
(nature of problem causing impoundment)
being experienced in the communities of Jamaica and Londonderry according to the U.S. Army Corps of Engineers, New England Division.

The Army Engineers continue to monitor the situation and will provide further information.

BALL MOUNTAIN LAKE

MEDIA NOTIFICATION LIST

Newspaper	Location	Telephone
AP	Boston, MA	617-357-8100
UPI	Boston, MA	617-227-4000

Radio Stations

WBFL	Westminster, VT	802-722-4890
WKVT	Brattleboro, VT	802-254-2343
WTSA	Brattleboro, VT	802-254-4577
WMMJ	Brattleboro, VT	802-254-4577
WNHV	White River Junction, VT	802-295-3093
WCFR	Springfield, VT	802-885-4555

Television Stations

WCAX - Channel 3	Burlington, VT	802-658-6300
WNNE - Channel 31	White River Junction, VT	802-295-3100
WMUR - Channel 9	Manchester, NH	603-623-8061
WCVB - Channel 5	Boston, MA	617-449-0400
WBZ - Channel 4	Boston, MA	617-787-7000
WNCA - Channel 7	Boston, MA	617-725-2700

BALL MOUNTAIN DAM

7-12a

7-12b

7-12c

7-12d

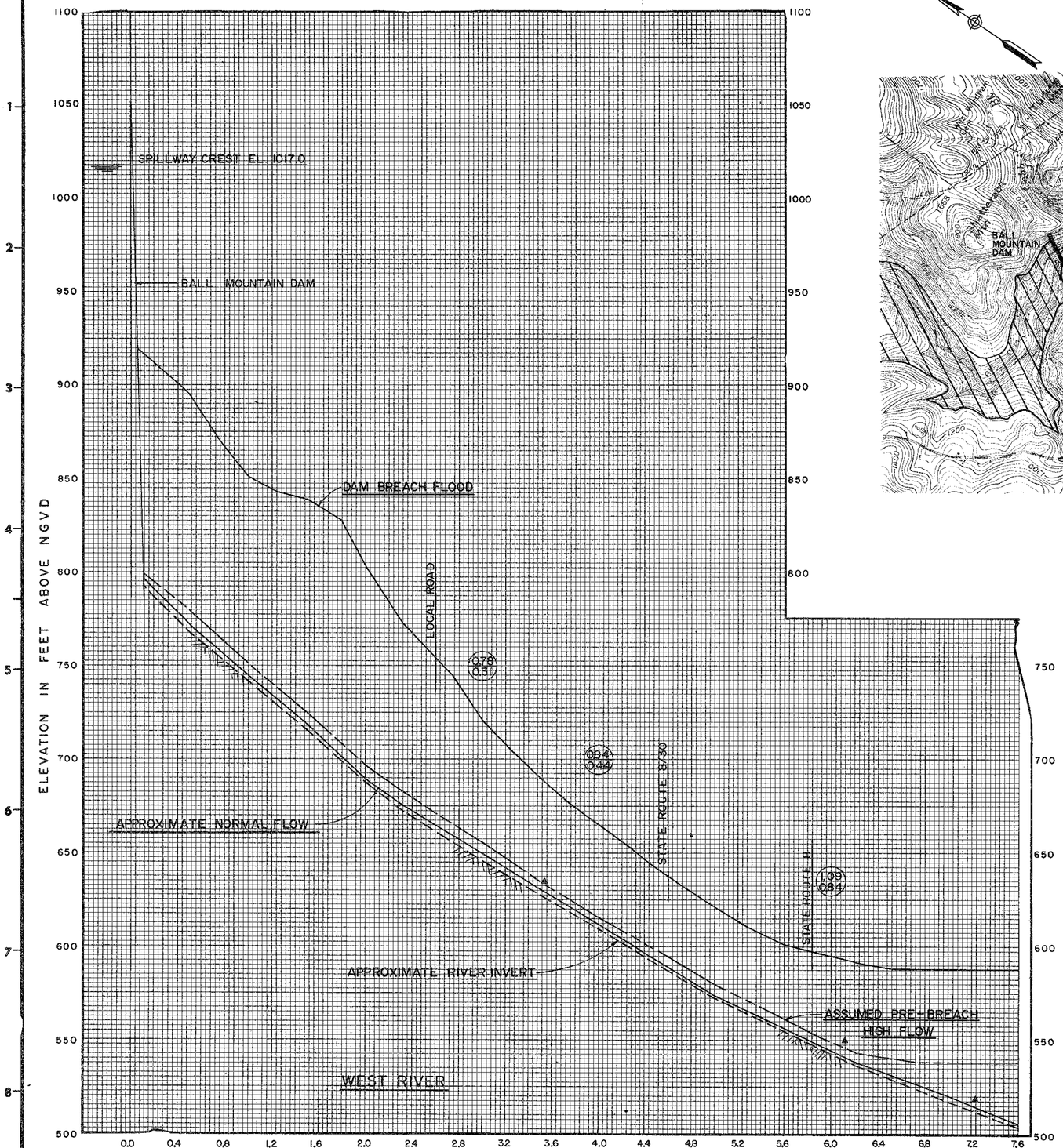
CONNECTICUT RIVER BASIN
BALL MOUNTAIN DAM

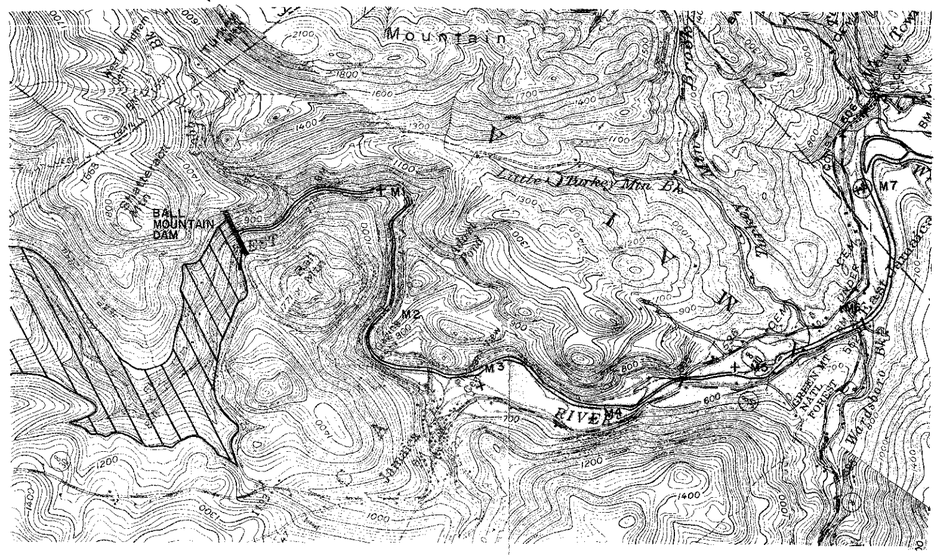
BREACH FLOOD
INDEX MAP

WEST RIVER VT.

PLATE 7-11

CORPS OF ENGINEERS U. S. ARMY





LEGEND

- 0.78 / 0.31 — HOURS FROM START OF FAILURE TO PEAK STAGE; HOURS TO INITIAL RIVER RISE
- LIMITS OF BREACH FLOOD
- +M1 — RIVER MILES DOWNSTREAM FROM BALL MOUNTAIN DAM
- ▲ — EXPERIENCED SEPTEMBER 1938 FLOOD ELEVATION
- ⊗ — EXPERIENCED MARCH 1936 FLOOD ELEVATION
- I — BRIDGE

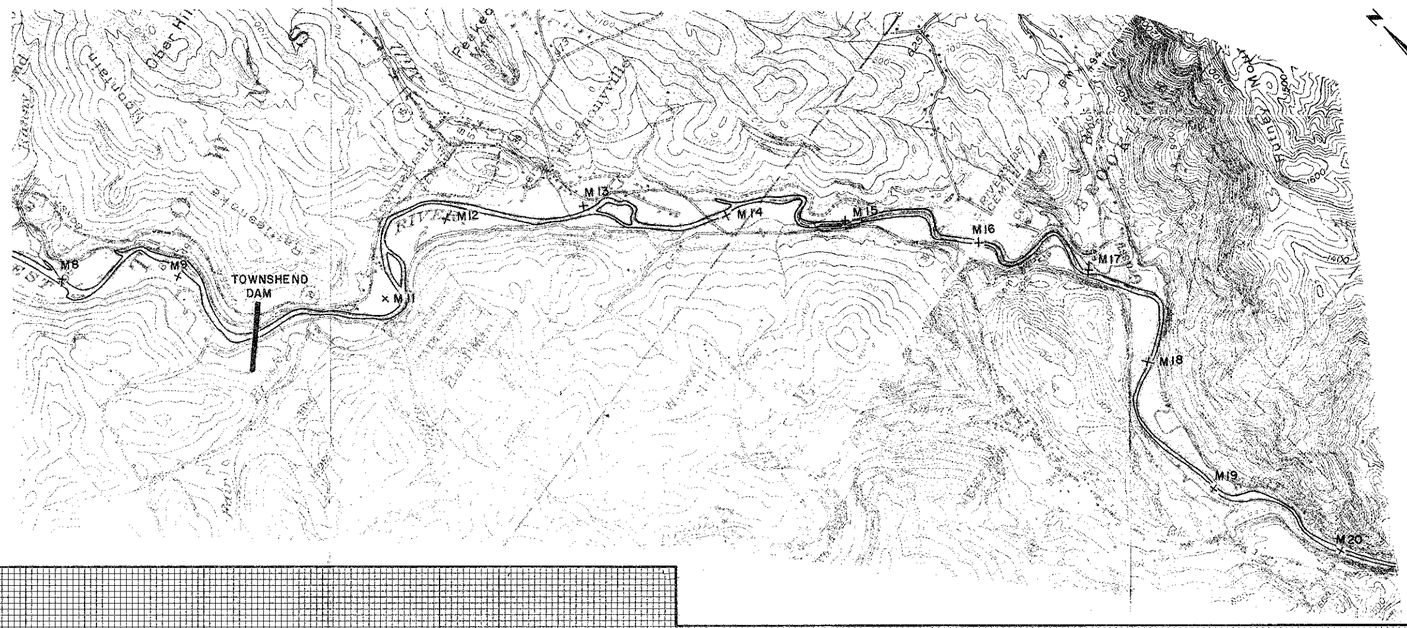
SCALE IN MILES
0.4 0 0.4 0.8 1

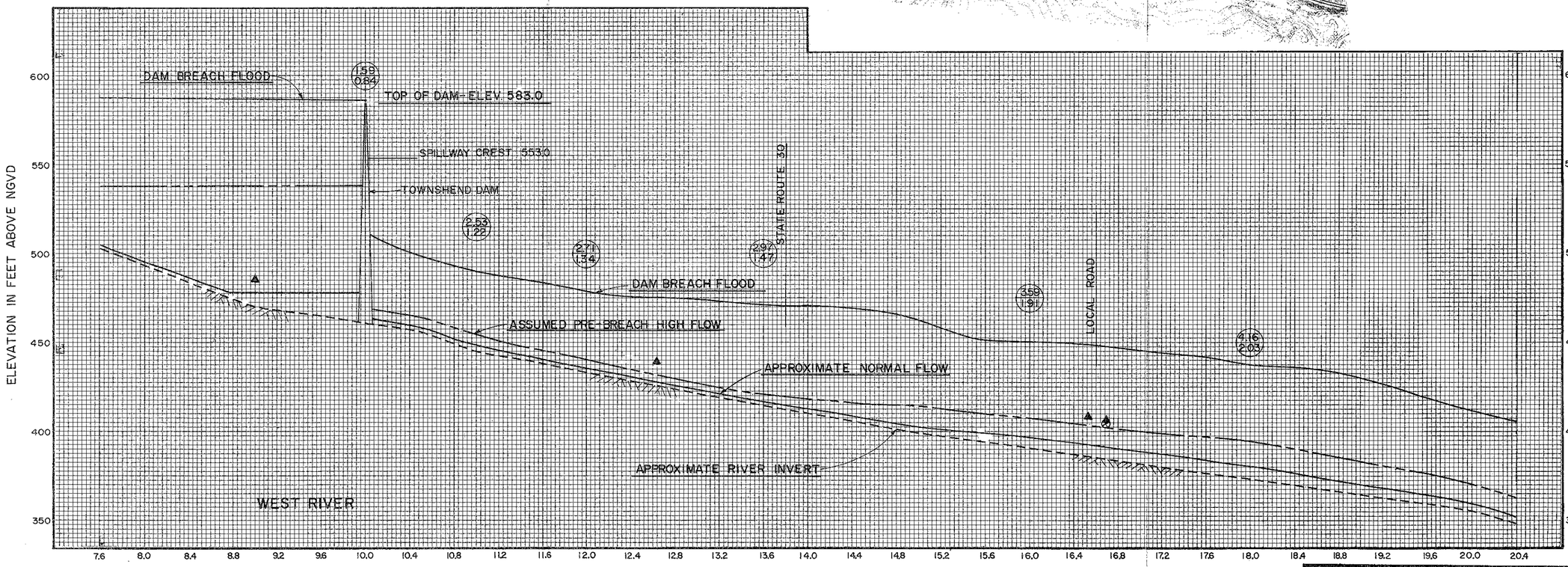
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY | TR. BY | CK BY
SUBMITTED: PROJECT ENGINEER
REVIEWED: CHIEF, SECTION
APPROVAL RECOMMENDED: CHIEF, BRANCH

CONNECTICUT RIVER BASIN
BALL MOUNTAIN DAM BREACH FLOOD
PLAN & PROFILE #1
HYD. AND WATER QUAL. SECT. SEPTEMBER 1981
APPROVED DATE
CHIEF, ENGINEERING DIVISION
SCALE | SPEC. NO. DACW 33
DRAWING NUMBER
SHEET

PLATE 7-12a





DISTANCE IN RIVER MILES FROM BALL MOUNTAIN DAM

SCALE IN MILES
0.4 0 0.4 0.8 1

NOTE: For legend see Plate 7-12a

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

BY	BY	CK. BY

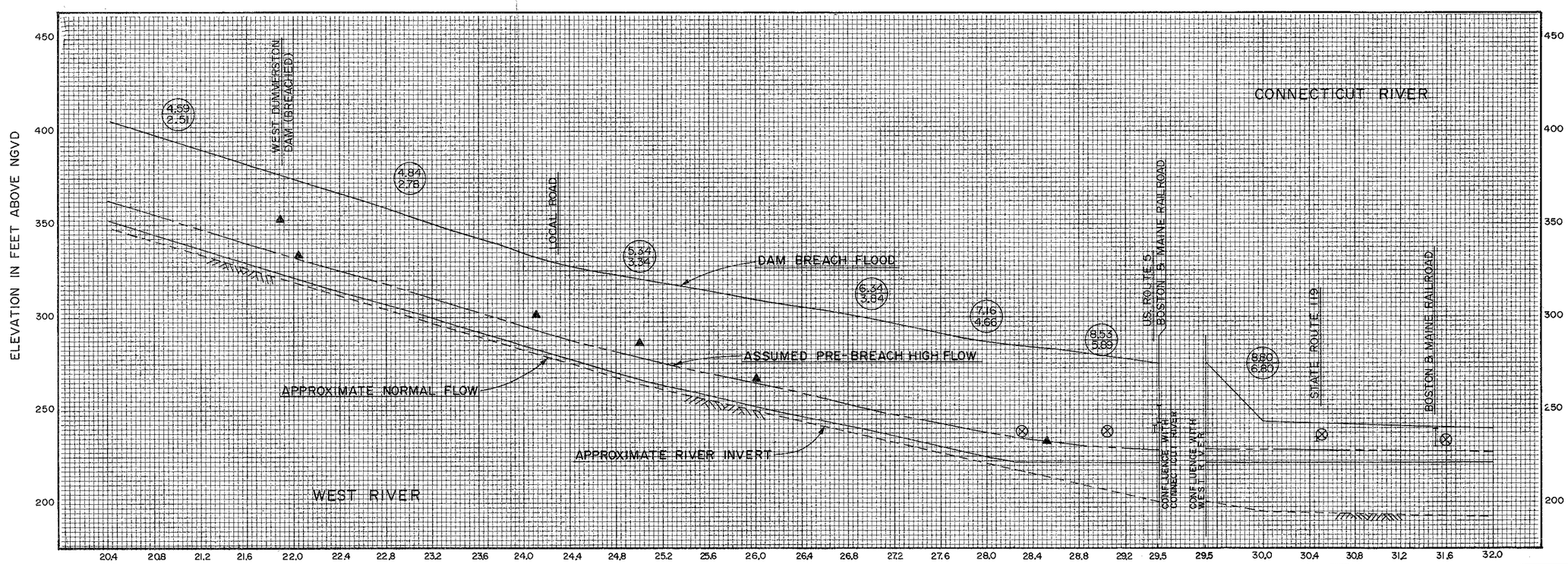
SUBMITTED:
CHIEF, SECT.

CONNECTICUT RIVER BASIN
BALL MOUNTAIN DAM BREACH FLOOD
PLAN & PROFILE #2
HYD. AND WATER QUAL. SECT. SEPTEMBER 1981

APPROVAL RECOMMENDED:
CHIEF, BRANCH
APPROVED DATE
CHIEF, ENGINEERING DIVISION

SCALE
DRAWING NUMBER

PLATE 7-12b



SCALE IN MILES
0.4 0 0.4 0.8 1

NOTE: For legend see Plate 7-12a

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY

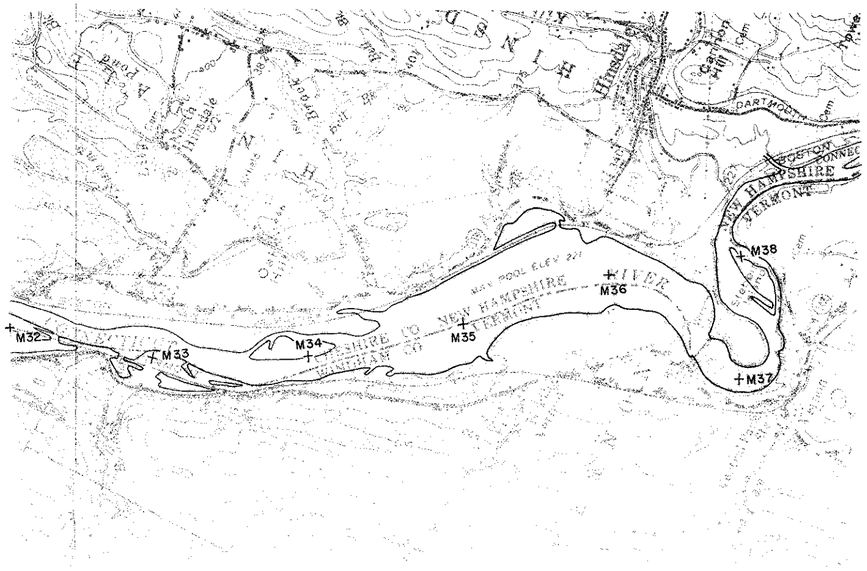
SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, BRANCH
REVIEWED:
PROJECT
APPROVAL RECOMMENDED:
CHIEF BRANCH

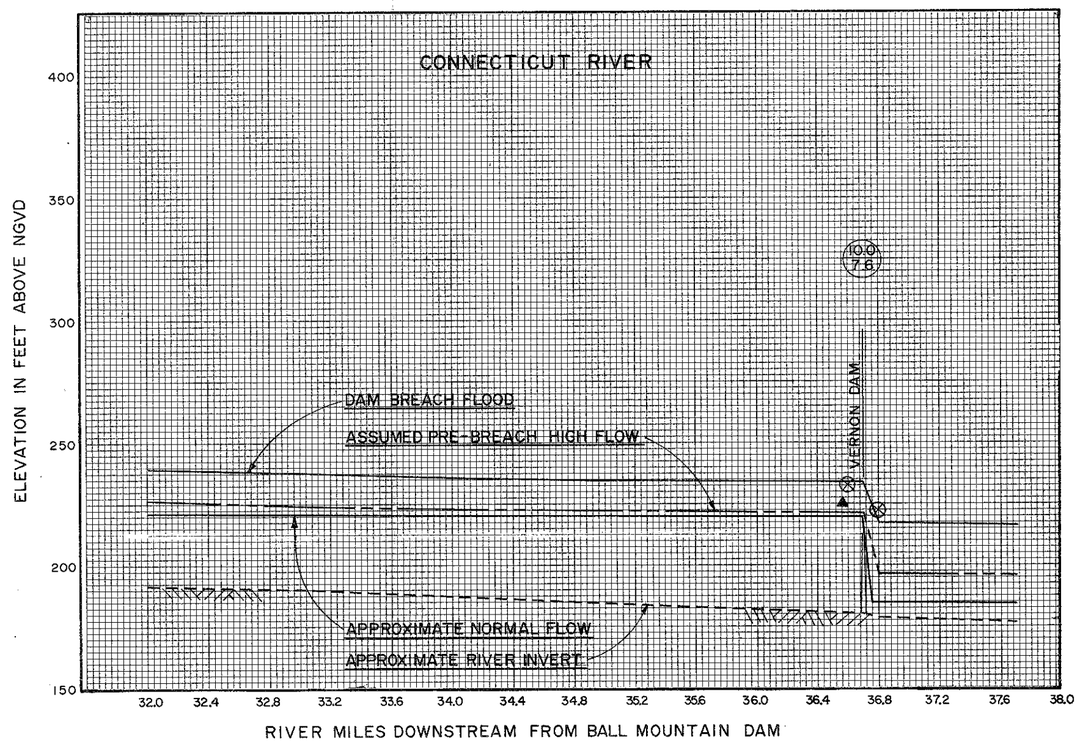
CONNECTICUT RIVER BASIN
BALL MOUNTAIN DAM BREACH FLOOD
PLAN & PROFILE #3
HYD. AND WATER QUAL. SECT. SEPTEMBER 1981
APPROVED DATE
CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO.
DRAWING NUMBER
SHEET

PLATE 7-12c

CORPS OF ENGINEERS — U. S. ARMY





SCALE IN MILES
0.4 0 0.4 0.8 1

NOTE: For legend see Plate 7-12a

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY

SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, BRANCH
REVIEWED:
PROJECT
APPROVAL RECOMMENDED:
CHIEF BRANCH

CONNECTICUT RIVER BASIN
BALL MOUNTAIN DAM BREACH FLOOD
PLAN & PROFILE #4
HYD. AND WATER QUAL. SECT. SEPTEMBER 1981
APPROVED
CHIEF, ENGINEERING DIVISION
DATE

SCALE
SPEC. NO.
DRAWING NUMBER
SHEET

PLATE 7-12d

8. PERIODIC REVIEW AND UPDATE

In accordance with ER 1130-2-419, the notification and reporting procedures prescribed in this Flood Emergency Plan should be reviewed at least annually with local, state and federal agencies at the field level with update as required.

In addition, the Corps of Engineers will periodically review and update this Flood Emergency Plan to keep it current. The MINIMUM specific items to be reviewed and updated are:

Section 1. INTRODUCTION

c. References

Section 2. DESCRIPTION OF PROJECT AREA

g. Instrumentation

Section 4. COMMUNICATIONS

d. Automatic Data Collection

Section 5. EMERGENCY IDENTIFICATION SUBPLAN

b. General

(1) Structural Stability of Concrete Structures
(2) Embankment Stability Re-evaluation
(3) Seismic Stability
(4) Periodic Inspection

c. Surveillance and Inspection

(1) Inspection of Floods

Section 6. EMERGENCY OPERATIONS AND REPAIR SUBPLAN

e. Emergency Contract Authority

Section 7. NOTIFICATION SUBPLAN

f. Inquiries and Press Releases

Plates	Title
5-1	Required Reconnaissance Inspection for Predetermined Elevations at 35 Dams

6-1a through 6-1f	Inventory of Equipment, Materials & Suppliers
7-5	Division Notification List/Emergency Response Team
7-6	Division Notification List/Division Personnel
7-7	Notification List for Local and State Officials and other Federal Agencies
7-8	HQUSACE Civil Works Project/Distress Notification List
7-10	Media Notification List

9. EVACUATION SUBPLAN

Evacuation plans are to be prepared by state and/or local Civil Preparedness officials. Upon completion, these plans will be included in this subplan.

The plans should include the following elements or any other appropriate element, as required:

a. Delineation of areas to be evacuated
b. Warning dissemination
c. Routes to be used
d. Traffic control measures
e. Shelters to be activated for the care of the evacuees
f. Methods for the movement of people without their own transportation
g. Identification of particular areas or facilities within the flood zones which will not require evacuation because of their location on high ground or similar circumstances
h. Identification and development of special procedures for the evacuation and care of people from institutions, such as hospitals, nursing homes, and prisons
i. Procedure for the perimeter and interior security of the area, including such things as passes, identification requirements and anti-looting patrols
j. Procedures for the lifting of the evacuation and re-entry of the area
k. Details indicating which organizations are responsible for specific functions and for furnishing the material, equipment and personnel resources required

The local jurisdiction should consider requesting the assistance of local Civil Preparedness Personnel, if available, who may have experience in emergency work. State and local law enforcement agencies usually will be responsible for the execution of much of the plan and should be represented in the planning effort. State and local laws and ordinances may require that other state, county and local government agencies will have a role in the preparation, review, approval or execution of the plan. Before finalization, a copy of the plan should be furnished to the Corps for information and comment.